emtest
the benchmark for emc

ALL YOU NEED FOR EMC TESTING

THE COMPLETE PRODUCT RANGE

INNOVATIVE EQUIPMENT FOR EMC TESTING AND MEASURING

EMC TESTING

EMI MEASURING

THE FULL RANGE OF EM TEST:
SOLUTIONS FOR ALL INDUSTRIAL SECTORS

THE EMC COMPANY

ELECTROMAGNETIC COMPATIBILITY

INNOVATIVE TECHNOLOGY FOR EMC TESTING AND MEASURING

Any electronic or electrical device is part of a complex environment, heavily charged with conducted and radiated interference. Every electronic or electrical device is required to operate as intended in this environment without generating electromagnetic disturbances affecting other devices in its vicinity. A wide range of standards and directives regulate both the susceptibility as well as the maximum permissible emission level for each device. For you as a manufacturer both aspects need to be carefully examined and considered from the very early stages of development to obtain a high-quality product in terms of electromagnetic compatibility. EM TEST offers outstanding expertise in EMC. Our solutions and know-how in testing the susceptibility and measuring emissions are recognised worldwide. EM TEST is the leading manufacturer of high-class, fully compliance EMC testing and measurement equipment for the electronics industry in the automotive, telecom, medical, industrial electronics, avionics and military sectors.

SPECIFIED IN STANDARDS

Standards provide a driving force in the EMC business and form the framework for any manufacturer of electronic products and systems, protecting and safeguarding the environment from unnecessary electromagnetic interference. Standards are vital in this sector and test equipment manufacturers make a valuable contribution in highlighting technical aspects and practical applications for the equipment specified in the standards. This leads to more application-oriented standards, to the direct benefit of the user. EM TEST experts are members of national and international research groups and standards committees.

In this way we contribute towards adaptive and practical standards. Consequently, we guarantee that the technical specifications are integrated in our products and testing procedures are interpreted according to the relevant standards. We thereby anticipate future developments of standards for the benefit of our customers.

NOT ONLY DO WE MANUFACTURE AND SUPPLY TEST EQUIPMENT WE ALSO PROVIDE COMPLETE SOLUTIONS, e.g.:

› FULL COMPLIANCE WITH CURRENT REQUIREMENTS AND ADAPTABILITY TO FUTURE DEVELOPMENTS

› ACCESSORIES FOR EASY AND COMPLIANT TEST SET-UP INSTALLATIONS

› USER-FRIENDLY TEST ROUTINES, LIBRARIES OF STANDARDS AND TEST REPORT GENERATION

THE OPERATION CONCEPT

THE BASIS FOR VERSATILE AND MULTIPLE APPLICATIONS

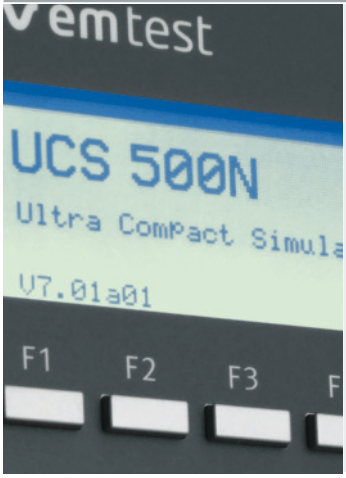
OUTSTANDING EASE OF OPERATION

Cursor keys and rotary knob ensure maximum user-friendliness operation of the simulator.

THE FUNCTION KEYS

Parameters and complete test routines are selected via function keys. Comprehensive navigation makes operation as easy as possible. Service and self-check routines enable the user to verify the generator.

CLEAR DISPLAY



Menus and parameters are clearly arranged in the LCD display for quick and accurate programming of tests.

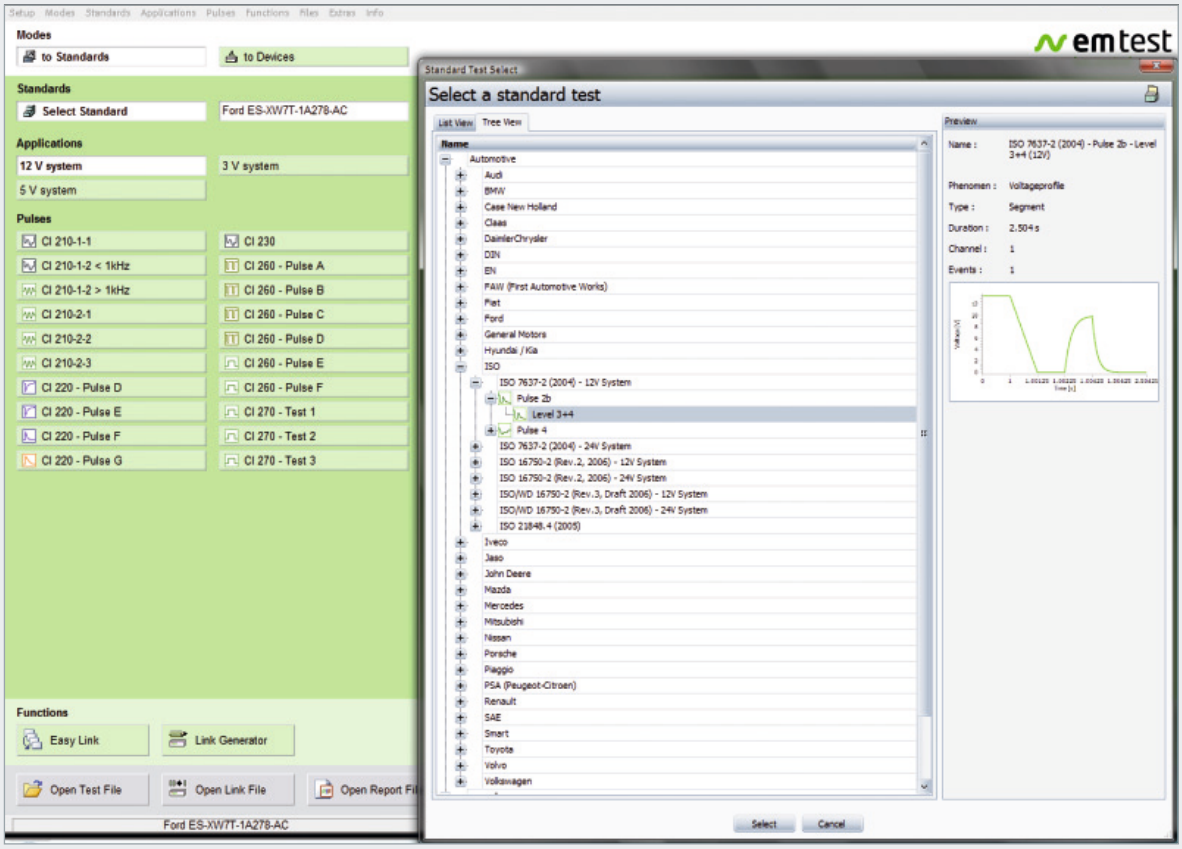
GPIB AND USB INTERFACES FAIL1 AND FAIL2

Every generator is equipped with both GPIB and USB interfaces for remote control. Fail1 and Fail2 inputs are implemented for DUT monitoring purposes.

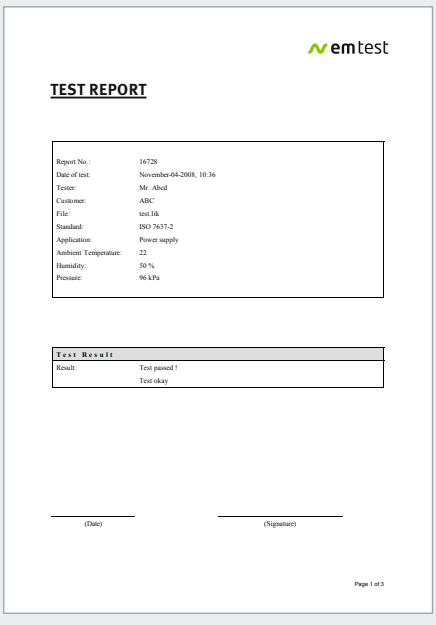
A CLOSER LOOK AT THE SOFTWARE

EVERYTHING IS THERE, EVERYTHING IS POSSIBLE

EASY SELECTION OF PREDEFINED NORMS AND PRODUCTS



PRESENTATION OF THE RESULTS AS AN WELL ARRANGED TEST REPORT



emtest

TEST REPORT

Report No.:	16728
Date of test:	November-04-2008, 10:36
Tester:	Mr. Abcd
Customer:	ABC
File:	test.lik
Standard:	ISO 7637-2
Application:	Power supply
Ambient Temperature:	22
Humidity:	50 %
Pressure:	96 kPa

Test Result	
Result:	Test passed !
	Test okay

(Date) (Signature)

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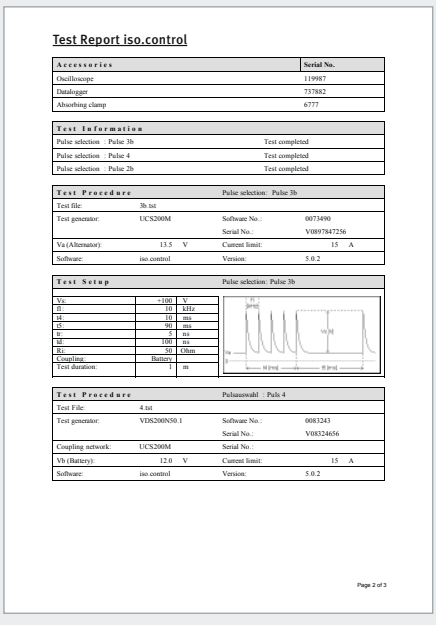

Test Report iso.control

Accessories	Serial No.
Oscilloscope	119987
Datalogger	737882
Absorbing clamp	6777

Test Information		
Pulse selection : Pulse 3b	Test completed	
Pulse selection : Pulse 4	Test completed	
Pulse selection : Pulse 2b	Test completed	

Test Procedure		Pulse selection: Pulse 3b	
Test file:	3b.tst		
Test generator:	UCS200M	Software No.:	0073490
		Serial No.:	V0897847256
Va (Alternator):	13.5 V	Current limit:	15 A
Software:	iso.control	Version:	5.0.2

Test Setup			Pulse selection: Pulse 3b
Vs:	+100	V	
tf:	10	kHz	
td:	10	ms	
tf:	90	ms	
tr:	5	ns	
td:	100	ns	
Ri:	50	Ohm	
Coupling:	Battery		
Test duration:	1	m	

Test Procedure		Pulsauswahl : Puls 4	
Test File:	4.tst		
Test generator:	VDS200N50.1	Software No.:	0083243
		Serial No.:	V0832465
Coupling network:	UCS200M	Serial No.:	
Vb (Battery):	12.0 V	Current limit:	15 A
Software:	iso.control	Version:	5.0.2

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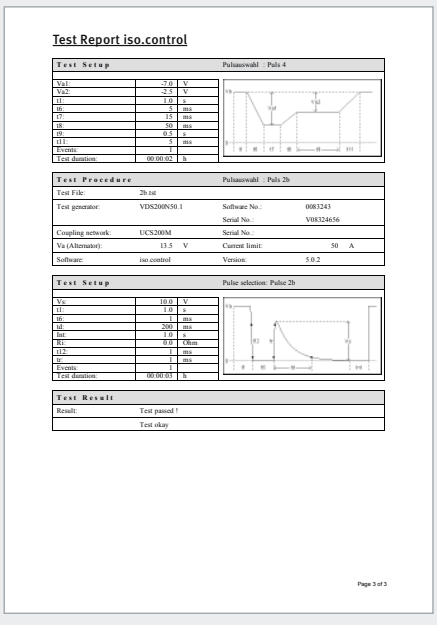

Test Report iso.control

Test Setup			Pulsauswahl : Puls 4
Va1:	-7.0	V	
Va2:	-2.5	V	
t1:	1.0	s	
t6:	5	ms	
t7:	15	ms	
t8:	50	ms	
t9:	0.5	s	
t11:	5	ms	
Events:	1		
Test duration:	00:00:02	h	

Test Procedure		Pulsauswahl : Puls 2b	
Test File:	2b.tst		
Test generator:	VDS200N50.1	Software No.:	0083243
		Serial No.:	V0832465
Coupling network:	UCS200M	Serial No.:	
Va (Alternator):	13.5 V	Current limit:	50 A
Software:	iso.control	Version:	5.0.2

Test Setup			Pulse selection: Pulse 2b
Vs:	10.0	V	
t1:	1.0	s	
t6:	1	ms	
td:	200	ms	
tst:	1.0	s	
Ri:	0.0	Ohm	
t12:	1	ms	
tr:	1	ms	
Events:	1		
Test duration:	00:00:03	h	

Test Result	
Result:	Test passed !
	Test okay

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AUTOMOTIVE

OVERVIEW							
Application	**Battery Simulation**	**Transients**	**Switching Transients**	**Conducted Immunity**	**Radiated Immunity**	**Transient Emission**	**Electrostatic Discharge**
Products	VDS 200Nx AutoWave	UCS 200N LD 200N LD 200Sx	PFS 200Nx RCB 200	CWS 500N2 CWS 500N3	CWS 500N2 CWS 500N3	BS 200B AutoWave	dito ESD 30N
Standards	ISO 16750 Manufacturer	ISO 7637 Manufacturer	Manufacturer	ISO 11452-X Manufacturer	ISO 11452-X Manufacturer	ISO 7637 Manufacturer	ISO 10605 Manufacturer

BATTERY SIMULATION

The VDS 200N series is used to simulate the various battery supply waveforms recommended by international standards and car manufacturer standards. The wide range of manufacturer requirements make this an extremely important area, which is covered by the VDS 200N series.
Additionally, the VDS 200N series serves as a powerful DC voltage supply for the DUT during tests with automotive transients.

AutoWave is used for the following applications:
- Generation of all kinds of voltage profile via software
- Replay of imported data or plot files, record & play
- Recording voltage variations in the real vehicle
- Replaying the measured data via a suitable DC source or amplifier
- Analysis of the recorded voltages and currents
- Export of measured data to other software tools

VDS 200N

Battery supply simulator and DC voltage source

- Stand-alone, programmable DC source
- Manual & remote operation
- 60 V/15 A up to 200 A (2,000 A inrush current)

ISO 7637-2, ISO 16750, manufacturer specifications

AUTOWAVE

Signal generator and recorder

- Simulating + measuring + analysing
- 16 bit resolution, 40 GByte hard disk memory
- Simultaneous record & play function

ISO 7637, vehicle manufacturer specifications

TECHNICAL DATA (OVERVIEW)	
Voltage range	0 V – 60 V with 0.1 V steps
VDS 200N15	I = 0 A – 15 A cont.
VDS 200N30	I = 0 A – 30 A cont.
Inrush current	I = 70 A for 500 ms
VDS 200N50	I = 0 A – 50 A cont.
Inrush current	I = 100 A for 500 ms
VDS 200N100	I = 0 A – 100 A cont.
Inrush current	I = 150 A for 500 ms
VDS 200N150	I = 0 A – 150 A cont.
VDS 200N200	I = 0 A – 200 A cont.
VDS 200N200.1	I = 0 A – 200 A cont.
Inrush current	I = 1,000 A for 100 ms
Preprogrammed pulses	2b, 4, sinewave, sinewave sweep, etc.
Zq = < 10 mΩ	

TECHNICAL DATA (OVERVIEW)
Wave generation
2 output channels standard
4 output channel optional
Output ±10 V/50 Ω
Resolution 16 bit
DC – 50 kHz
Sample rate 500 kHz
Waveform segments
DC voltage
Sine wave
Sine wave sweep
Sine ramped
Square wave
Triangular wave
Saw-tooth wave
Ramp up/Ramp down
Exponential wave
Wave record
2-channel measuring input
±5 V, 10 V, 20 V, 50 V, 100 V

TRANSIENTS

The UCS 200N Ultra Compact Simulator for automotive transients unites the capabilities of an EFT/burst simulator, a micropulse simulator and the required coupling network in one box. The UCS 200N can be equipped to meet all international and car manufacturer specifications from around the globe. The coupling network can carry currents up to 200 A depending on the model. For non-standard tests the waveform parameters of the micropulse generator can be varied over a wide range. The built-in coupling network can be used and controlled by any unit of the LD 200N series, VDS 200N series and PFS 200Nx series.

Load Dump pulses simulate the sudden disconnection (e.g. by corrosion) of the battery from the alternator while the alternator is generating current to load the battery. Such Load Dump pulses are high-energy pulses with a high destructive potential. The LD 200N simulates these high-energy pulses having a duration time in the range of hundreds of milliseconds.

UCS 200N

Ultra Compact Simulator for automotive transients
for pulses 1, 2a and 3a/3b

› Test pulses acc. to ISO, JASO, NISSAN, SAE
› Manual & remote operation
› Freestyle pulse shape generation

ISO 7637-2, ISO 7637-3, SAE J1113, JASO D001, manufacturer specifications

LD 200N

Automotive high-energy Load Dump generator
for pulses 5 and 7

› RLC Generator, test pulses 5a/5b as per ISO 7637-2
› Manual & remote operation
› Real internal resistor, selectable

ISD 7637-2, SAE J1113, manufacturer specifications

TECHNICAL DATA (OVERVIEW)	
Pulse 3a/3b as per ISO 7637-2	
Open-circuit:	25 V – 1,000 V
Rise time:	5 ns
Pulse duration:	150 ns
Ri:	50 Ω
3a › negative, 3b › positive	
Micropulses as per ISO 7637-2	
Open-circuit:	20 V – 600 V
Pulse 1, 1a, 2a and 6	
Ri:	2, 4, 10, 20, 30, 50, 90 Ω
Output coaxial connector	50 Ω
SAE J1455 inductive & mutual	
NISSAN B2, C8, C50, C300	
JASO A2, B2, D2	
Freestyle	
Open-circuit:	20 V – 600 V
Rise time tr:	1 µs – 10 µs
Duration td:	50 µs – 10,000 µs
Ri:	2 – 450 Ω
DUT supply:	60 V/50 A

TECHNICAL DATA (OVERVIEW)	
Pulse 5a as per ISO 7637-2	
Open-circuit:	20 V – 200 V
Rise time:	5 ms – 10 ms
Pulse duration:	40 ms – 400 ms
Ri:	selectable 0.5 – 38 Ω in 0.1 Ω steps
Pulse 5b as per ISO 7637-2	Clipped Load Dump
Clipp voltage	15 V – 95.5 V in 0.5 V steps
Manufacturer specifications	
SAE 1455, JASO, Chrysler, Ford	
Scania, Mercedes, Nissan	
Freestyle	
Rise time tr:	‹ 1 µs
	10 µs – 90 µs with 10 µs steps
	100 µs – 900 µs with 100 µs steps
	1 ms – 10 ms with 1 ms steps
Pulse duration	10 ms to 1,200 ms
Internal resistor	0.5 – 38 Ω in 0.1 Ω steps

TRANSIENTS

Load Dump pulses simulate the sudden disconnection (e.g. by corrosion) of the battery from the alternator while the alternator is generating current to load the battery. Such Load Dump pulses are high-energy pulses with a high destructive potential. The LD 200Sx simulates these high-energy pulses having a duration time in the range of hundreds of milliseconds.

Micropulses occur in the battery supply system when an inductive load is disconnected from the DC supply. Their polarity depends on whether the inductive load is of a passive (e.g. a heater) or an active type (e.g. a DC motor). These pulses have a rise time in the low µs range and a duration of several tenths or hundreds or thousands of µs. The generator has a built-in battery switch to interrupt the DC supply voltage as required and is designed to withstand pulses up to 1,100 V.

LD 200SX

› Field decay and Load Dump as per Toyota
› Spark gap test included
› Manual & remote operation

TECHNICAL DATA (OVERVIEW)	
LD 200S18 as per Toyota	Field decay
LD 200S19 as per Toyota	Load Dump Pulse 1
	Load Dump Pulse 2
	Load Dump Pulse 3

MPG 200S5

Micropulse generator: up to 1,100 V

› Pulse 1 and pulse 2 as per ISO 7637
› Test voltage up to 1,100 Volt
› Manual & remote operation

ISO 7637-2:1990, Renault 36.00.400/B, Volvo EMC requirements (1998)

TECHNICAL DATA (OVERVIEW)	
Pulse 1 (24 V) as per ISO 7637	
Open-circuit voltage	50 V – 1,100 V
Rise time	‹ 3 µs
Pulse duration	1,000 µs
Ri	50 Ω
Polarity	Negative
Pulse 2 as per ISO 7637	
Open-circuit	50 V – 1,100 V
Rise time	‹ 1 µs
Pulse duration	50 µs
Ri	2 Ω
Polarity	Positive
DUT supply:	60 V/25 A
Ri:	2, 4, 10, 20, 30, 50 Ω

CONDUCTED AND RADIATED IMMUNITY

Bulk Current Injection (BCI) is a test procedure to test immunity to electrical disturbances caused by narrowband electromagnetic energy. The test signal is injected by means of a current injection probe. In physical terms the current injection probe is a current transformer laid around the wiring harness. Immunity tests are performed varying the level and the frequency of the injected test signal. The BCI test method is widely known in the automotive industry as well as in the military/aircraft industry to test single components of a complex system.

The CWS 500N3 is a state-of-the-art solution in a compact one-box design to test immunity to conducted audio frequency disturbances and low-frequency magnetic fields. The CWS 500N3 includes signal generator, LF amplifier, coupling transformer, frequency selective current and voltage monitor, software and GPIB interface.
ICD software supports the test routines, controls external measuring devices and automatically generates test reports with all test data included.

CWS 500N2

Bulk Current Injection (BCI) testing

› Compact simulator as per ISO 11452-4; EN 61000-4-6
› 10 kHz to 400 MHz, 100 W (expandable up to 1 GHz)
› System solution is fully designed and supported by EM TEST

ISO 11452-4, ISO 11452-5, vehicle manufacturer specifications

CWS 500N3

Audio frequency and magnetic field testing

› Conducted & radiated immunity up to 250 kHz
› Built-in voltage/current measurement
› Built-in coupling transformer 1 : 2

ISO 11452-10, vehicle manufacturer specifications, SAE J1113, MIL-STD 461

TECHNICAL DATA (OVERVIEW)	
BCI method	ISO 11452-4
Output power	100 W (nominal)
Output impedance	50 Ω
Max. VSWR	1 : 2.0
Output level	-13 dBm – 50 dBm
Sinusoidal (CW)	10 kHz – 1,000 MHz
Modulation	AM 1 – 3,000 Hz, 0 – 95%
	PM 1 – 3,000 Hz
	Duty cycle 10% – 80%
Output	N-connector
Built-in power meter	Channel 1 forward power
	Channel 2 reverse power
	Channel 3 injected current
Built-in coupler	Max 200 W/1 GHz

TECHNICAL DATA (OVERVIEW)	
Conducted immunity	ISO 11452-10
Output level	0.001 V – max. 6.5 Vrms
Output current	Max. 14 A
Frequency range	10 Hz to 250 kHz
Output power nominal	100 W
Output power peak	400 W
Output impedance	‹ 0.5 Ω
Harmonic distortion	‹ 15 dBc at max. power
Coupling	Audio transformer included
Measurements	Freq. selective volt/amp meter
Verification load	0.5 Ω & 4 Ω included
Radiated immunity	ISO 11452-8
Magnetic field	Max. 1,000 A/m up to 1 kHz
Frequency range	15 Hz to 150 kHz
Radiating loop	As per MIL 461E
Magnetic field sensor	As per ISO 11452-8
Current sensor	Included

SWITCHING TRANSIENTS

The PFS 200N Power Fail Simulator is used to comply with standard requirements, mainly from vehicle manufacturers, to perform fast voltage dips and drops (micro-interruptions). Some standards specify very fast rise and fall times below 1 microsecond which require an electronic switch.

The RCB 200 is used to comply with standard requirements, mainly from vehicle manufacturers, to perform fast voltage dips and drops (micro-interruptions).

PFS 200N

Power Fail Simulator

› Voltage dropout, voltage dip, micro-interruption
› 60 V/30 A up to 200 A
› Manual & remote operation

Chrysler PF 9326, Fiat 9.90110, Ford ES-XW7T-1A278-AB, Ford WDR 00.00 EA, JASO D001-94, Mitsubishi ES-X82010, Nissan 28401 NDS 02, PSA B21 7090, PSA B21 7110, Renault 36.00.808/--D, Renault 36.00.808/--E, Renault 36.00.808/--F, Toyota TSC3500G, Toyota TSC3590G, Toyota TSC7203G, BMW GS 95003-2, DaimlerChrysler DC-10615 Rev. A, Freightliner 49-00085, Hyundai ES 39110-00, Mack Trucks 606GS15, Volvo EMC requirements (1998), Volvo EMC requirements (2002), Renault 36.00.808/--G, DaimlerChrysler DC-10842, Toyota TSC6203G

TECHNICAL DATA (OVERVIEW)	
PFS 200N30	Max. battery supply voltage 60 V
Nominal current	I = 0 A – 30 A cont.
Inrush current	Max. I = 70 A for 500 ms
PFS 200N50	Max. battery supply voltage 60 V
Nominal current	I = 0 A – 50 A cont.
Inrush current	Max. I = 100 A for 500 ms
PFS 200N100	Max. battery supply voltage 60 V
Nominal current	I = 0 A – 100 A cont.
Inrush current	Max. I = 150 A for 500 ms
PFS 200N150	Max. battery supply voltage 60 V
Nominal current	I = 0 A – 150 A cont.
PFS 200N200	Max. battery supply voltage 60 V
Nominal current	I = 0 A – 200 A cont.
Switching time	(on/off) < 1 µs

RCB 200

› Transient generator for Ford application
› Ford CI-220, pulse A1, A2, B1, B2, C
› Ford CI-260, pulse F

TECHNICAL DATA (OVERVIEW)
Generation of transients by relay switching
according to Ford ES-XW7T-1A278-AC
Ford CI-220, pulse A1, A2, B1, B2, C
Ford CI-260, pulse F

TRANSIENT EMISSION

The BS 200B is used to measure transient emissions to the wiring harness of parts and components installed in a vehicle. Additionally a required LISN is available. The network and the switch can be operated independently as required for the measurements.

ACCESSORIES AUTOMOTIVE

A complete overview of EM TEST accessories for the various test applications is given on pages 52 – 58.

BS 200B

Artificial network for measurement of transient emissions

› 30 V/25 A
› Integrated mechanical switch
› External artificial network available

ISO 7637-1:1990, ISO 7637-2:1990, ISO 7637-2:2004

TECHNICAL DATA (OVERVIEW)	
Transient emission as per ISO 7637-2	
Voltage range	0 – 30 VDC
Rated current	25 A
Short-circuit protected	10 Hz to 250 kHz
Max. inrush current	› 500 A
Peak voltage capability	1,000 V
Overvoltage protection	By varistors
Electronic switch	
Switching time (test load 7 µH/0.6 Ω)	300 – 400 ns
Switch-off time can be selected	10 ms/200 ms
Artificial network	
Shunt resistor (Rs)	
Internal selectable	120 Ω, 40 Ω, 20 Ω, 10 Ω
Dimensions & test set-up	As specified in ISO 7637-2
CABS calibration load	
Impedance according to ISO 7637	5 µH – 50 Ω
Inductance	5 µH/5 mΩ

CALIBRATION SET CAEFT KIT

Acc. to IEC 61000-4-4, ed. 2

› Connection to: UCS 200N, UCS 500Nx, EFT 500Nx

The pulse shape of EFT/burst generators designed as per IEC 61000-4-4 have to be verified at 50 Ω as well at 1,000 Ω load. Both matching resistors additionally include a voltage divider to measure the wave form.

CA ISO

› Connection to: UCS 200N, LD 200Nx, LD 200Sx

A different set of resistors is used for the verification of transient generators as per Iso 7637-2. The generator output is measured under matched load conditions which means $R_I = R_L$.

ELECTROSTATIC DISCHARGE

Electrostatic discharges either from a human body to any other part or between two different objects can cause persistent disturbances or even destruction to sensitive electronics or controls. Voltages of several thousand volts are generated. dito is the most advanced ESD tester to simulate ESD pulses as accurately as possible according to the latest standards.

DITO

The ultimate ESD tester

› Ergonomic design
› Modular concept
› Ease of handling

Bellcore GR-1089-Core, EN 300340, EN 300342-1, EN 300386 V1.3.2, EN 301489-1, EN 301489-7, EN 301489-17, EN 301489-24, EN 55024, IEC 61000-4-2, ITU-T K.20, ITU-T K.21, ITU-T K.45, ISO 10605, JASO D001-94, Chrysler PF 9326, DaimlerChrysler PF-10540, Fiat 9.90110, Ford WDR 00.00EA, Renault 36.00.400/B, Renault 36.00.400/C, Toyota TSC3500G, Toyota TSC3590G, Volvo EMC requirements (1998), EN 300329

TECHNICAL DATA (OVERVIEW)	
ESD as per IEC 61000-4-2	
Test voltage	0.5 – 16.5 kV
Discharge	Air/contact discharge
Polarity	Positive/negative
Hold-on time	› 5 s
R/C parameter	150 pF/330 Ω
Specification contact discharge	500 V to 10 kV
Rise time tr	0.7 – 1 ns
Peak of discharge currents	3.75 A/kV
ESD as per ISO 10605	
Test voltage	0.5 – 16.5 kV
Discharge	Air/contact discharge
Polarity	Positive/negative
R/C parameters	100 pF/1,500 Ω
	150 pF/330 Ω
	330 pF/330 Ω
	150 pF/2,000 Ω
	330 pF/2,000 Ω
Specification contact discharge	500 V to 10 kV
Rise time tr	0.7 – 1 ns
Peak of discharge currents	3.75 A/kV

ESD 30N

ESD tester up to 30 kV

› Up to 30 kV contact & air discharge
› Interchangeable discharge networks
› For automotive, commercial and military applications

IEC 61000-4-2, ISO 10605, SAE J1113-13, SAE J1455, BMW 600 13.0 (Part 2), BMW GS 5002 (1999), DaimlerChrysler DC-10613, DaimlerChrysler DC-10614, Mercedes AV EMV, Ford ES-XW7T-1A278-AB, GMW 3097, GMW 3097 (2001), GMW 3100, GMW 3100 (2001), Mazda MES PW 67600, Mitsubishi ES-X82010, Nissan 28401 NDS 02, Porsche, PSA B21 7110, Renault 36.00.808/-D, Renault 36.00.808/-E, Renault 36.00.808/-F, Smart DE1005B, VW TL 824 66, MBN 10284-2:2002, Renault 36.00.808/-G

TECHNICAL DATA (OVERVIEW)	
ESD as per IEC 61000-4-2 and ISO 10605	
Test voltage	Max. 30 kV
Discharge	Air/contact discharge
Polarity	Positive/negative
Hold-on time	› 5 s
Specification contact discharge	0.2 – 30 kV
Rise time tr	0.7 – 1 ns
Peak of discharge currents	3.75 A/kV
R/C parameters	150pF/330 Ω –– 330pF/330 Ω
	150pF/2,000 Ω –– 330pF/2,000 Ω
	100pF/1,500 Ω –– customized
Special technical highlights	
- RC network values indicated on the LCD	
- AD or CD discharge mode indicated on the LCD	
- Active discharge finger control	
- Bleed-off function to discharge the EUT	
- Temperature and humidity sensor included	
- USB or optical interface included	
- esd.control software	
- AC or DC power supply (battery mode included)	

TELECOM

OVERVIEW						
Application	**Power Mains Simulation**	**Transients**	**Conducted Immunity**	**Radiated Immunity**	**Harmonics & Flicker**	**Electrostatic Discharge**
Products	PFS 503Sx UCS 500Nx	UCS 500Nx VCS 500Nx	CWS 500N1 CWS 500N2	UCS 500Nx	DPA 500N ACS 500N	dito ESD 30N
Standards	ITU K ... ETSI	ITU K ... ETSI BELLCORE FCC part 68	ITU K ... ETSI	ITU K ... ETSI	ITU K ... ETSI	ITU K ... ETSI BELLCORE

TRANSIENTS, RADIATED IMMUNITY AND POWER MAINS SIMULATION

The UCS 500N4/UCS 500N7 Ultra Compact Simulator is the most versatile tester to cover transient and power-fail requirements according to international standards (basic and generic standards) and product family standards with voltage capability of up to 7 kV. In addition to the IEC 61000-4-5 standard for surge testing it also complies with ANSI/IEEE C62.41 for surge and ring wave testing.

The UCS 500N7 is the most economical test solution for fully compliant immunity tests and CE marking. Having a built-in CDN for single-phase EUT up to 300 V and max. 16 A. It can be extended for testing three-phase EUTs by means of an automatically controlled external coupling network up to 690 V with max. 100 A.
EM TEST supplies a large range of accessories for the various applications.

UCS 500N4

Compact tester for EFT/burst, surge and power fail

› Small and compact all-in-one tester
› IEC 61000-4-4/-5/-8/-9/-11/-29
› Built-in single-phase CDN

IEC 61000-4-4, IEC 61000-4-5, IEC 61000-4-8, IEC 61000-4-9, IEC 61000-4-11, IEC 61000-4-29, EN 61000-6-1, EN 61000-6-2, EN 55024, EN 300340, EN 300342-1, EN 300386 V1.3.2, EN 301489-1, EN 301489-7, EN 301489-17, EN 301489-24, ITU-T K.20, ITU-T K.21, ITU-T K.41, ITU-T K.45, EN 300329

TECHNICAL DATA (OVERVIEW)	
EFT as per IEC 61000-4-4, ed. 2	
Open-circuit	200 V – 4,400 V
Rise time tr	5 ns
Pulse duration td	50 ns
Source impedance	Zq = 50 Ω
Polarity	Positive/negative
Surge as per IEC 61000-4-5	
Open-circuit voltage 1.2/50 µs	160 V – 4,000 V
Short-circuit current 8/20 µs	80 A – 2,000 A
Polarity	Positive/negative/alternate
Mag. field as per IEC 61000-4-9	100, 300, 1,000 A/m
Dips as per IEC 61000-4-11	
AC voltage/current	Max. 250 V/16 A
Inrush current	More than 500 A
Mag. field as per IEC 61000-4-8	1, 3, 10 and 30 A/m with MC 2630 100, 300 and 1,000 A/m with MC26100
Telecom surge as per IEC 61000-4-5	
Open-circuit 10/700 µs	160 V – 4,000 V
Short-circuit current 4/300 µs	4 A – 100 A

UCS 500N7

Compact tester for EFT/burst, surge, ring wave and power fail

› Testing beyond the limits, 5.5 kV EFT & 7 kV surge
› Optional RWG module as per 61000-4-12
› Manual & remote operation

IEC 61000-4-4, IEC 61000-4-5, IEC 61000-4-8, IEC 61000-4-9, IEC 61000-4-11, IEC 61000-4-12, IEC 61000-4-29, EN 61000-6-1, EN 61000-6-2, ITU-T K.20, ITU-T K.21, ITU-T K.45, Bellcore GR-1089-Core, ANSI/IEEE C62.41, EN 61543, IEC 61008-1, IEC 61009-1

TECHNICAL DATA	
EFT as per IEC 61000-4-4, ed. 2	
Open-circuit	200 V – 5,500 V
Rise time tr	5 ns
Pulse duration td	50 ns
Source impedance	Zq = 50 Ω
Polarity	Positive/negative
Surge as per IEC 61000-4-5	
Open-circuit voltage 1.2/50 µs	250 V – 7,000 V
Short-circuit current 8/20 µs	125 A – 3,500 A
Polarity	Positive/negative/alternate
Mag. field as per IEC 61000-4-9	100, 300, 1,000 A/m
Dips as per IEC 61000-4-11	
AC voltage/current	Max. 300 V/16 A
Inrush current	More than 500 A
Mag. field as per IEC 61000-4-8	1, 3, 10 and 30 A/m with MC 2630 100, 300 and 1,000 A/m with MC26100
Ring wave as per IEC 61000-4-12	
Open-circuit voltage 0.5 µs/100 kHz	6,000 V with 12 Ω and 30 Ω source impedance
Telecom surge as per IEC 61000-4-5	
Open-circuit 10/700 µs	250 V – 7,000 V
Short-circuit current 4/300 µs	6 A – 175 A

TRANSIENTS

Surge pulses occur due to direct or indirect lightning strikes to an external (outdoor) circuit. This leads to currents or electromagnetic fields causing high-voltage or current transients. Another source of surge pulses are switching transients originating from switching disturbances and system faults. Due to the characteristic of the phenomenon nearly every electrical and electronic device may suffer from such lightning events. Surge tests should therefore be widely performed. Surge voltage can reach several thousands of volts and surge current is seen to reach several thousands of amps.

VCS 500N4

Surge tester 4.4 kV

› 4.4 kV/2.2 kA surge, IEC 61000-4-5/-9
› Preprogrammed standard test routines included
› Built-in single-phase CDN

IEC 61000-4-5, IEC 61000-4-9, EN 300329, EN 300340, EN 300342-1, EN 300386 V1.3.2, EN 300386-2, EN 301489-1, EN 301489-7, EN 301489-17, EN 301489-24, EN 55024, ITU-T K.20, ITU-T K.21, ITU-T K.41, ITU-T K.45

TECHNICAL DATA (OVERVIEW)	
Surge as per IEC 61000-4-5	
Open-circuit voltage	160 V – 4,400 V
Wave shape	
Rise time tr	1.0 µs
Pulse duration	50 µs
Short-circuit current	80 A – 2,200 A
Wave shape	
Rise time tr	6.4 µs
Pulse duration	16 µs
Polarity	Positive/negative/alternate
Output direct	HV-banana connector
Coupling network	L – N with Z = 2 Ω
	L-PE, N-PE, L+N-PE; Z = 12 Ω

VCS 500N8

Surge tester 8 kV

› Testing beyond the limits, 8 kV/4 kA, IEC 61000-4-5/-9
› Manual & remote operation
› Built-in single or 3-phase CDN

IEC 61000-4-5, IEC 61000-4-9, EN 300329, EN 300340, EN 300342-1, EN 300386 V1.3.2, EN 300386-2, EN 301489-1, EN 301489-7, EN 301489-17, EN 301489-24, EN 55024, ITU-T K.20, ITU-T K.21, ITU-T K.41, ITU-T K.45

TECHNICAL DATA (OVERVIEW)	
Surge as per IEC 61000-4-5	
Open-circuit voltage	250 V – 8,000 V
Wave shape	
Rise time tr	1.0 µs
Pulse duration	50 µs
Short-circuit current	125 A – 4,000 A
Wave shape	
Rise time tr	6.4 µs
Pulse duration	16 µs
Polarity	Positive/negative/alternate
Output direct	HV-banana connector
Coupling network	L – N with Z = 2 Ω
	L-PE, N-PE, L+N-PE; Z = 12 Ω

VCS 500N10

Surge tester 10 kV

› Still compact in size but up to 10 kV/5 kA, IEC 61000-4-5/-9
› Manual & remote operation
› External CDNs for power mains and I/O line applications

IEC 61000-4-5, IEC 61000-4-9, EN 300329, EN 300340, EN 300342-1, EN 300386 V1.3.2, EN 300386-2, EN 301489-1, EN 301489-7, EN 301489-17, EN 301489-24, EN 55024, ITU-T K.20, ITU-T K.21, ITU-T K.41, ITU-T K.45

TECHNICAL DATA (OVERVIEW)	
Surge as per IEC 61000-4-5	
Open-circuit voltage	250 V – 10,000 V
Wave shape	
Rise time tr	1.0 µs
Pulse duration	50 µs
Short-circuit current	125 A – 5,000 A
Wave shape	
Rise time tr	6.4 µs
Pulse duration	16 µs
Polarity	Positive/negative/alternate
Output direct	HV-banana connector
Coupling network	External option

VCS 500N7T

Surge & telecom tester 7 kV

› IEC 61000-4-5, ITU
› 7.0 kV/3.5 kA surge & 7.0 kV telecom surge 10 µs/700 µs
› Built-in single-phase CDN

IEC 61000-4-5, IEC 61000-4-9, EN 300329, EN 300340, EN 300342-1, EN 300386 V1.3.2, EN 300386-2, EN 301489-1, EN 301489-7, EN 301489-17, EN 301489-24, EN 55024, ITU-T K.20, ITU-T K.21, ITU-T K.41, ITU-T K.45

TECHNICAL DATA (OVERVIEW)	
Surge as per IEC 61000-4-5	
Open-circuit voltage	250 V – 7,000 V
Wave shape	
Rise time tr	1,0 µs
Pulse duration	50 µs
Short-circuit current	125 A – 3,500 A
Wave shape	
Rise time tr	6.4 µs
Pulse duration	16 µs
Polarity	Positive/negative/alternate
Output direct	HV-banana connector
Coupling network	L – N with Z = 2 Ω
	L-PE, N-PE, L+N-PE; Z = 12 Ω
Telecom surge	250 V – 7,000 V
Front time	10 µs
Pulse duration	700 µs
Short-circuit current	6.0 – 175 A
Rise time tr	4 µs
Pulse duration	300 µs

TRANSIENTS

Telecommunication networks are exposed to lightning events. Therefore telecommunication equipment that is connected to the outside world needs to have appropriate protection that demonstrates an acceptable level of immunity to surge transients in order not to fail during lightning events. Telecom surge simulators of the TSS 500 series are used to test the immunity of telecommunication equipment.

TSS 500M4

Telecom surge tester 4 kV

› Compact telecom surge generator as per ITU
› Built-in 1.2/50 µs & 10/700 µs transients
› Built-in coupling network; 4 × 100 Ω and 2 × 25 Ω

FCC 97-270 (part 68), IEC 61000-4-5, ITU-T K.17, ITU-T K.20, ITU-T K.21, ITU-T K.28, ITU-T K.45

TECHNICAL DATA (OVERVIEW)	
Open-circuit voltage	160 V – 4,000 V
Telecom surge as per ITU K ...	
Wave shape	
Front time tf	1.2 µs
Duration td	50 µs
Wave shape open-circuit	
Front time tf	10 µs
Duration td	700 µs
Wave shape short-circuit current	4 – 100 A
Rise time tr	4 µs
Duration td	300 µs
Surge B as per FCC part 68	
Wave shape open-circuit	
Front time tf	9 µs
Duration td	720 µs
Wave shape short-circuit current	4 – 100 A
Rise time tr	5 µs
Duration td	320 µs

TSS 500M10

Telecom surge tester 10 kV

› Extra-high voltage telecom surge generator as per ITU
› Up to 10 kV peak voltage
› Built-in coupling network; 4 × 100 Ω and 2 × 25 Ω

FCC 97-270 (part 68), IEC 61000-4-5, ITU-T K.17, ITU-T K.20, ITU-T K.21, ITU-T K.28, ITU-T K.45

TECHNICAL DATA (OVERVIEW)	
Open-circuit voltage	500 V – 10,000 V
Telecom surge as per ITU K ...	
Wave shape	
Front time tf	1.2 µs
Duration td	50 µs
Wave shape open-circuit	
Front time tf	10 µs
Duration td	700 µs
Wave shape short-circuit current	12.5 – 250 A
Rise time tr	4 µs
Duration td	300 µs
Surge B as per FCC part 68	
Wave shape open-circuit	
Front time tf	9 µs
Duration td	720 µs
Wave shape short-circuit current	12.5 – 250 A
Rise time tr	5 µs
Duration td	320 µs

TSS 500M4B

Telecom surge tester

› High-power telecom surge generator as per GR 1089
› 10/250 µs for open-circuit voltage and short-circuit current
› Up to 4 kV peak voltage and 2 kA peak current

TECHNICAL DATA (OVERVIEW)	
First level lightning	2,000 V/1,000 A
Rise time tr	10 µs
Duration td	250 µs
Second level lightning	4,000 V/2,000 A
Rise time tr	10 µs
Duration td	250 µs
First level lightning surge	3,000 V/2,000 A
Rise time tr	10 µs
Duration td	250 µs
High exposure premises	4,000 V/4 × 500 A
Rise time tr	10 µs
Duration td	250 µs
4 wire application	4 × 500 A for T, R, T1, R1

TSS 500M6B

Telecom surge tester

› Compact telecom surge generator as per GR 1089
› All 10/360 µs, 10/1,000 µs and 2/10 µs included
› Built-in resistive coupling network

Bellcore GR-1089-Core, ITU-T K.12, ITU-T K.28, ITU-T K.45

TECHNICAL DATA (OVERVIEW)	
First-level lightning	
Pulse 10/1,000 µs with 6 Ω	1,000 V & 167 A per conductor
Rise time tr/Pulse duration td	10 µs/1,000 µs
Pulse 10/360 µs with 10 Ω	1,000 V & 100 A per conductor
Rise time tr/Pulse duration td	10 µs/360 µs
Pulse 10/1,000 µs with 10 Ω	1,000 V & 100 A per conductor
Rise time tr/Pulse duration td	10 µs/1,000 µs
Pulse 2/10 µs with 5 Ω	2,500 V & 500 A per conductor
Rise time tr/Pulse duration td	2 µs/10 µs
Pulse 10/360 µs with 40 Ω	1,000 V & 25 A per conductor
Rise time tr/Pulse duration td	10 µs/360 µs
Intra-building lightning	
Pulse 2/10 µs with 8 Ω	2,500 V & 312 A per conductor
Rise time tr/Pulse duration td	2 µs/10 µs
Pulse 2/10 µs with 15 Ω	2,500 V & 167 A per conductor
Rise time tr/Pulse duration td	2 µs/10 µs
Second-level lightning	
Pulse 2/10 µs with 10 Ω	5,000 V & 500 A per conductor
Rise time tr/Pulse duration td	2 µs/10 µs

TSS 500M2

Telecom surge tester

- High-power telecom surge generator as per GR 1089
- 10/1,000 µs for open-circuit voltage and short-circuit current
- Up to 2 kV peak voltage and 200 A per wire peak current

TECHNICAL DATA (OVERVIEW)	
Pulse 10/1,000 µs with 10 Ω	2,000 V & 200 A per conductor
Rise time tr/Pulse duration td	10 µs/1,000 µs
4 wire application	T, R, T1, R1

TSS 500M2F

Telecom surge generator for surge A pulses as per FCC part 68

- Compact telecom surge generator as per FCC part 68
- Built-in 10/160 µs & 10/560 µs transients
- Built-in resistive coupling network

FCC 97-270 (part 68)

TECHNICAL DATA (OVERVIEW)	
AC power port surge	160 V – 2,500 V
Rise time tr	‹ 2.0 µs
Pulse duration	› 10 µs
Short-circuit current	› 1,000 A
Rise time tr	‹ 2.0 µs
Pulse duration	› 10 µs
Coupling network	L to N, L to PE, N to PE; Zi = 2.5 Ω
Metallic surge	Max. 1,000 V
Rise time tr	‹ 10 µs
Pulse duration	› 560 µs
Short-circuit current	Min. 100 A per conductor
Rise time tr	‹ 10 µs
Pulse duration	› 560 µs
Longitudinal surge	Max. 1,500 V
Rise time tr	‹ 10 µs
Pulse duration	› 160 µs
Short-circuit current	Min. 200 A per conductor
Rise time tr	‹ 10 µs
Pulse duration	› 160 µs

ELECTROSTATIC DISCHARGE

Electrostatic discharges either from a human body to any other part or between two different objects can cause persistent disturbances or even destruction to sensitive electronics or controls. Voltages of several thousand volts are generated. dito is the most advanced ESD tester to simulate ESD pulses as accurately as possible according to the latest standards.

DITO

The ultimate ESD tester

› Ergonomic design
› Modular concept
› Ease of handling

Bellcore GR-1089-Core, EN 300340, EN 300342-1, EN 300386 V1.3.2, EN 301489-1, EN 301489-7, EN 301489-17, EN 301489-24, EN 55024, IEC 61000-4-2, ITU-T K.20, ITU-T K.21, ITU-T K.45, ISO 10605, JASO D001-94, Chrysler PF 9326, DaimlerChrysler PF-10540, Fiat 9.90110, Ford WDR 00.00EA, Renault 36.00.400/B, Renault 36.00.400/C, Toyota TSC3500G, Toyota TSC3590G, Volvo EMC requirements (1998), EN 300329

TECHNICAL DATA (OVERVIEW)	
ESD as per IEC 61000-4-2	
Test voltage	0.5 – 16.5 kV
Discharge	Air/contact discharge
Polarity	Positive/negative
Hold-on time	› 5 s
R/C parameter	150 pF/330 Ω
Specification contact discharge	500 V to 10 kV
Rise time tr	0.7 – 1 ns
Peak of discharge currents	3.75 A/kV
ESD as per ISO 10605	
Test voltage	0.5 – 16.5 kV
Discharge	Air/contact discharge
Polarity	Positive/negative
R/C parameters	100 pF/1,500 Ω
	150 pF/330 Ω
	330 pF/330 Ω
	150 pF/2,000 Ω
	330 pF/2,000 Ω
Specification contact discharge	500 V to 10 kV
Rise time tr	0.7 – 1 ns
Peak of discharge currents	3.75 A/kV

ESD 30N

ESD tester up to 30 kV

› Up to 30 kV contact & air discharge
› Interchangeable discharge networks
› For automotive, commercial and military applications

IEC 61000-4-2, ISO 10605, SAE J1113-13, SAE J1455, BMW 600 13.0 (Part 2), BMW GS 5002 (1999), DaimlerChrysler DC-10613, DaimlerChrysler DC-10614, Mercedes AV EMV, Ford ES-XW7T-1A278-AB, GMW 3097, GMW 3097 (2001), GMW 3100, GMW 3100 (2001), Mazda MES PW 67600, Mitsubishi ES-X82010, Nissan 28401 NDS 02, Porsche, PSA B21 7110, Renault 36.00.808/-D, Renault 36.00.808/-E, Renault 36.00.808/-F, Smart DE1005B, VW TL 824 66, MBN 10284-2:2002, Renault 36.00.808/-G

TECHNICAL DATA (OVERVIEW)	
ESD as per IEC 61000-4-2 and ISO 10605	
Test voltage	Max. 30 kV
Discharge	Air/contact discharge
Polarity	Positive/negative
Hold-on time	› 5 s
Specification contact discharge	0.2 – 30 kV
Rise time tr	0.7 – 1 ns
Peak of discharge currents	3.75 A/kV
R/C parameters	150pF/330 Ω –– 330pF/330 Ω
	150pF/2,000 Ω –– 330pF/2,000 Ω
	100pF/1,500 Ω –– customized
Special technical highlights	
- RC network values indicated on the LCD	
- AD or CD discharge mode indicated on the LCD	
- Active discharge finger control	
- Bleed-off function to discharge the EUT	
- Temperature and humidity sensor included	
- USB or optical interface included	
- esd.control software	
- Power supply: AC (88 – 250 V), DC (11 – 16 V)	
- Battery mode included for several hours	

CONDUCTED AND RADIATED IMMUNITY

The CWS 500N1 is the most compact single-box test equipment to test conducted rf immunity as per IEC 61000-4-6 and related standards. As well as 1 kHz 80% AM the CWS 500N1 also generates 2 Hz 80% AM to test medical appliances and 1 Hz PM with 50% duty cycle required to test safety equipment such as fire alarms. EM TEST supplies a large range of CDNs, EM clamps, current injection clamps and calibration accessories.

Bulk Current Injection (BCI) is a test procedure to test the immunity to electrical disturbances from narrowband electromagnetic energy. The test signal is injected by means of a current injection probe. In physical terms the current injection probe is a current transformer laid around the wiring harness. Immunity tests are performed varying the level and the frequency of the injected test signal. The BCI test method is widely known in the automotive industry as well as in the military/aircraft industry to test single components of a complex system.

CWS 500N1

The single-box solution for rf-conducted immunity testing

› RF-conducted immunity testing as per IEC 61000-4-6
› Up to 300 MHz test frequency
› Self-calibration procedures for CDNs and coupling clamps

IEC 61000-4-6, IEC 60601-1-2:2002, EN 300340, EN 300342- 1, EN 300386 V1.3.2, EN 301489-1, EN 301489-7, EN 301489-17, EN 301489-24, EN 55024, EN 61000-6-1, EN 61000-6-2, EN 300329

TECHNICAL DATA (OVERVIEW)	
Frequency range	9 kHz – 1 GHz (internal signal generator)
Modulation	AM 1 – 3,000 Hz, 0 – 95%
	PM 1 – 3,000 Hz
	Duty cycle 10% – 80%
With built-in amplifier	100 kHz – 300 MHz
Output level	1 – 30 Vrms after 6 dB-attenuator
Output power	80 W (nominal)
Output impedance	50 Ω
max. VSWR	1 : 1.2 at all phase angles and at max. power (without destruction)
Harmonic distortion	‹ 15 dBc
Preprogrammed modulation method	Amplitude modulation
	80% ‹ ±5%, 1 kHz ‹ ±10%
	80% ‹ ±5%, 2 Hz, 1 kHz
Pulse modulation	1 Hz, 50% duty cycle acc. to EN 50130-4

CWS 500N2

The single-box solution for rf-conducted immunity testing

› Compact simulator as per ISO 11452-4; EN 61000-4-6
› 10 kHz to 400 MHz, 100 W (expandable up to 1 GHz)
› System solution is fully designed and supported by EM TEST

IEC 61000-4-6, EN 61000-6-1, EN 61000-6-2, IEC 60601-1-2:2002, ISO 11452-4, ISO 11452-5, DaimlerChrysler DC-10614, Ford ES-XW7T-1A278-AB, Ford ESXW7T- 1A278-AC, GMW 3097 (2001), GMW 3097 (2004), MBN 10284-2:2002, PSA B21 7110, Renault 36.00.808/-D, Renault 36.00.808/-G, MIL STD 461D/CS 114, MIL STD 461E/CS 114, RTCA/DO 160 Section 20, Fiat 9.90110

TECHNICAL DATA (OVERVIEW)	
Output power	100 W (nominal)
Output impedance	50 Ω
Max. VSWR	1 : 2.0
Output level	-13 dBm – 50 dBm
Sinusoidal (CW)	10 kHz – 1,000 MHz
Modulation	AM 1 – 3,000 Hz, 0 – 95%
	PM 1 – 3,000 Hz
	Duty cycle 10% – 80%
Output	N-connector
Built-in power meter	Channel 1 forward power
	Channel 2 reverse power
	Channel 3 injected current
Built-in coupler	Max 200 W/1 GHz

HARMONICS & FLICKER

Harmonics and interharmonics are caused by modern electronic power conditioning modules. Such modules (mostly non-linear) to control loads and reduce power consumption are the source of voltage at unwanted frequencies superimposed on the supply voltage. Voltage fluctuations caused by varying load currents may influence luminance or spectral distribution of lighting systems. The impression of unsteadiness of visual sensation induced by this light stimulus is called flicker. Flicker also needs to be limited to a minimum. The DPA 500N is used for single-phase applications and the DPA 503 is used for 3-phase applications but also supports single-phase applications. ACS 500N is a single-phase and the ACS 503 a 3-phase AC source, specially designed for harmonics and flicker testing.
It meets the corresponding specifications as per IEC/EN 61000-3-2 and IEC/EN 61000-3-3. It provides the perfect sinusoidal and stable voltage signal specified to give fully compliant harmonics and flicker analyses irrespective of the mains supply frequency and steadiness of the voltage.

DPA 500N

Single-phase power analyser, H&F analyser

› Single-phase harmonics/flicker analyser
› Built-in single-phase flicker impedance
› Real-time analysis using internal computer and DSP

IEC 61000-3-2, IEC 61000-3-3, IEC 61000-3-11, IEC 61000-3-12, IEC 61000-4-7, IEC 61000-4-15, IEC 60601-1-2:2002, EN 61000-6-1, EN 61000-6-2, EN 301489-1, EN 301489-7, EN 301489-17, EN 301489-24, EN 300386-2, EN 61000-3-2, EN 61000-3-3, EN 61000-3-11, EN 61000-3-12, EN 61000-4-7, EN 61000-4-15, JIS C 61000-3-2

TECHNICAL DATA (OVERVIEW)	
Input channels	2 (1 × current & voltage)
EUT connection	1-phase
A/D converter	16 bit
Class of instrument	Class A as per IEC/EN 61000-4-7, ed. 2
Voltage input	10 – 530 Vrms
Overload	4,000 V peak
Current input	50 A
Input range internal	50 A peak – 16 A continuous
Input range external	Standard delivered model max. 140 A (factory setting 2 turns 70 A)
Harmonic analysis	IEC/EN 61000-3-2 and IEC/EN 61000-3-12, according to IEC/EN 61000-4-7
Harmonic range	1 – 50th harmonic
Grouping	Interharmonics acc. to IEC/EN 61000-4-7, ed. 2
Display	Urms, irms, ipeak, upeak, P, Q, S, power Factor, THD(U), THD(I), crest factor(u), crest factor(i)
Flicker analysis	IEC/EN 61000-3-3 and IEC/EN 61000-3-11, according to IEC/EN 61000-4-15
Flicker data	P_{st} and P_{lt}, Vrms, dmax, dc, dt, P50, P10, P3, P1, P0.1
Flicker impedance: Phase | Neutral	0.24 Ω + j 0.15 Ω | 0.16 Ω + j 0.10 Ω

ACS 500N

Single-phase AC voltage source up to 6 kVA

› AC power source up to 300 V/20 A single phase
› Large inrush current capability
› Controlled by DPA 500 and ISMDPA software

IEC 61000-3-2, IEC 61000-3-3, EN 61000-3-2, EN 61000-3-3, IEC 61000-3-11

TECHNICAL DATA (OVERVIEW)	
ACS 500N6	
Voltage range	0 to 300 V
Voltage resolution	0.025% (12 bit)
Output frequency	10 Hz to 80 Hz
Output power	6,000 VA
Output connector	Safety banana-plug
ACS 500N2	
Voltage range	0 to 300 V
Voltage resolution	0.025% (12 bit)
Output frequency	10 Hz to 80 Hz
Output power	2,000 VA
Output connector	Safety banana-plug

INDUSTRY
MEDICAL
RESIDENTIAL
BROADCAST

OVERVIEW						
Application	**Power Mains SImulation**	**Transients**	**Conducted Immunity**	**Radiated Immunity**	**Harmonics & Flicker**	**Electrostatic Discharge**
Products	PFS 503Sx UCS 500Nx	UCS 500Nx EFT 500Nx VCS 500Nx OCS 500M6 TSS 500Mx	CWS 500N1 CWS 500N2 CWS 500N4	UCS 500Nx OCS 500M6	DPA 500N ACS 500N DPA 503 ACS 503 AIF 503	dito ESD 30N
Standards	IEC 1000-4-11	IEC 61000-4-4 IEC 61000-4-5 IEC 61000-4-12	IEC 61000-4-6	IEC 61000-4-8 IEC 61000-4-9 IEC 61000-4-10	IEC 61000-3-2 IEC 61000-3-3 IEC 61000-3-11 IEC 61000-3-12	IEC 61000-4-2

TRANSIENTS, RADIATED IMMUNITY AND POWER MAINS SIMULATION

The UCS 500N4/UCS 500N7 Ultra Compact Simulator is the most versatile tester to cover transient and power-fail requirements according to international standards (basic and generic standards) and product family standards with voltage capability of up to 7 kV. In addition to the IEC 61000-4-5 standard for surge testing it also complies with ANSI/IEEE C62.41 for surge and ring wave testing.

The UCS 500N7 is the most economical test solution for fully compliant immunity tests and CE marking. Having a built-in CDN for single-phase EUT up to 300 V and max. 16 A. It can be extended for testing three-phase EUTs by means of an automatically controlled external coupling network up to 690 V with max. 100 A.
EM TEST supplies a large range of accessories for the various applications.

UCS 500N4

Compact tester for EFT/burst, surge and power fail

› Small and compact all-in-one tester
› IEC 61000-4-4/-5/-8/-9/-11/-29
› Built-in single-phase CDN

IEC 61000-4-4, IEC 61000-4-5, IEC 61000-4-8, IEC 61000-4-9, IEC 61000-4-11, IEC 61000-4-29, EN 61000-6-1, EN 61000-6-2, EN 55024, EN 300340, EN 300342-1, EN 300386 V1.3.2, EN 301489-1, EN 301489-7, EN 301489-17, EN 301489-24, ITU-T K.20, ITU-T K.21, ITU-T K.41, ITU-T K.45, EN 300329

UCS 500N7

Compact tester for EFT/burst, surge, ring wave and power fail

› Testing beyond the limits, 5.5 kV EFT & 7 kV surge
› Optional RWG module as per 61000-4-12
› Manual & remote operation

IEC 61000-4-4, IEC 61000-4-5, IEC 61000-4-8, IEC 61000-4-9, IEC 61000-4-11, IEC 61000-4-12, IEC 61000-4-29, EN 61000-6-1, EN 61000-6-2, ITU-T K.20, ITU-T K.21, ITU-T K.45, Bellcore GR-1089-Core, ANSI/IEEE C62.41, EN 61543, IEC 61008-1, IEC 61009-1

TECHNICAL DATA (OVERVIEW)	
EFT as per IEC 61000-4-4, ed. 2	
Open-circuit	200 V – 4,400 V
Rise time tr	5 ns
Pulse duration td	50 ns
Source impedance	Zq = 50 Ω
Polarity	Positive/negative
Surge as per IEC 61000-4-5	
Open-circuit voltage 1.2/50 µs	160 V – 4,000 V
Short-circuit current 8/20 µs	80 A – 2,000 A
Polarity	Positive/negative/alternate
Mag. field as per IEC 61000-4-9	100, 300, 1,000 A/m
Dips as per IEC 61000-4-11	
AC voltage/current	Max. 250 V/16 A
Inrush current	More than 500 A
Mag. field as per IEC 61000-4-8	1, 3, 10 and 30 A/m with MC 2630 100, 300 and 1,000 A/m with MC26100
Telecom surge as per IEC 61000-4-5	
Open-circuit 10/700 µs	160 V – 4,000 V
Short-circuit current 4/300 µs	4 A – 100 A

TECHNICAL DATA	
EFT as per IEC 61000-4-4, ed. 2	
Open-circuit	200 V – 5,500 V
Rise time tr	5 ns
Pulse duration td	50 ns
Source impedance	Zq = 50 Ω
Polarity	Positive/negative
Surge as per IEC 61000-4-5	
Open-circuit voltage 1.2/50 µs	250 V – 7,000 V
Short-circuit current 8/20 µs	125 A – 3,500 A
Polarity	Positive/negative/alternate
Mag. field as per IEC 61000-4-9	100, 300, 1,000 A/m
Dips as per IEC 61000-4-11	
AC voltage/current	Max. 300 V/16 A
Inrush current	More than 500 A
Mag. field as per IEC 61000-4-8	1, 3, 10 and 30 A/m with MC 2630 100, 300 and 1,000 A/m with MC26100
Ring wave as per IEC 61000-4-12	
Open-circuit voltage 0.5 µs/100 kHz	6,000 V with 12 Ω and 30 Ω source impedance
Telecom surge as per IEC 61000-4-5	
Open-circuit 10/700 µs	250 V – 7,000 V
Short-circuit current 4/300 µs	6 A – 175 A

TRANSIENTS

EFT 500Nx – an EFT/burst generator – is an intelligent solution offering exactly what you need for full-compliance immunity tests for electrical/fast transient phenomena. The distinct operation features, convenient DUT connection facilities, a clearly arranged menu structure and display concept as well as the preprogrammed standard test routines make testing easy, reliable and safe. Extendable with a variety of test accessories the EFT 500Nx is a universal device for a broad range of recommendations, including three-phase applications up to 100 A.

EFT 500N5

Electronic-fast-transient simulator

› Fast-transient simulator as per IEC 61000-4-4, ed. 2
› Output voltage 4.8 kV, spike frequency up to 1 MHz
› Manual & remote operation

IEC 61000-4-4 second edition 2004-7, EN 61000-4-4:2005-07

TECHNICAL DATA (OVERVIEW)	
EFT as per IEC 61000-4-4, ed. 2	
Open-circuit	200 V – 4,800 V
Wave shape into a 50 Ω load	100 V – 2,400 V
Rise time tr	5 ns
Pulse duration td	50 ns
Wave shape into a 1,000 Ω load	200 V – 4,800 V
Rise time tr	5 ns
Pulse duration td	35 ns – 150 ns
Source impedance	Zq = 50 Ω
Polarity	Positive/negative
Output 50 Ω coaxial connector	To connect external coupler
Coupling network	To L, N, PE all combinations
Verification	
Coaxial output	Wave shape on 50 Ω and 1,000 Ω
CDN output	Wave shape 5/50 ns on 50 Ω during common mode coupling
DUT power mains supply	AC 250 V/16 A, 50/60 Hz; DC 250 V/10 A

EFT 500N8

Electronic-fast-transient simulator

› Fast-transient simulator as per IEC 61000-4-4, ed. 2
› Output voltage 7 kV, spike frequency up to 1 MHz
› Built-in single-phase CDN

IEC 61000-4-4 second edition 2004-7, EN 61000-4-4:2005-07

TECHNICAL DATA (OVERVIEW)	
EFT as per IEC 61000-4-4, ed. 2	
Open-circuit	1,000 V – 7,000 V
Wave shape into a 50 Ω load	500 V – 3,500 V
Rise time tr	5 ns
Pulse duration td	50 ns
Wave shape into a 1,000 Ω load	1,000 V – 7,000 V
Rise time tr	5 ns
Pulse duration td	35 ns – 150 ns
Source impedance	Zq = 50 Ω
Polarity	Positive/negative
Output 50 Ω coaxial connector	To connect external coupler
Coupling network	To L, N, PE all combinations
Verification	
Coaxial output	Wave shape on 50 Ω and 1,000 Ω
CDN output	Wave shape 5/50 ns on 50 Ω during common mode coupling
DUT power mains supply	AC 250 V/16 A, 50/60 Hz; DC 250 V/10 A

TRANSIENTS

Surge pulses occur due to direct or indirect lightning strikes to an external (outdoor) circuit. This leads to currents or electromagnetic fields causing high-voltage or current transients. Another source of surge pulses are switching transients originating from switching disturbances and system faults. Due to the characteristic of the phenomenon nearly every electrical and electronic device may suffer from such lightning events. Surge tests should therefore be widely performed. Surge voltage can reach several thousands of volts and surge current is seen to reach several thousands of amps.

VCS 500N4

Surge tester 4.4 kV

› 4.4 kV/2.2 kA surge, IEC 61000-4-5/-9
› Preprogrammed standard test routines included
› Built-in single-phase CDN

IEC 61000-4-5, IEC 61000-4-9, EN 300329, EN 300340, EN 300342-1, EN 300386 V1.3.2, EN 300386-2, EN 301489-1, EN 301489-7, EN 301489-17, EN 301489-24, EN 55024, ITU-T K.20, ITU-T K.21, ITU-T K.41, ITU-T K.45

TECHNICAL DATA (OVERVIEW)	
Surge as per IEC 61000-4-5	
Open-circuit voltage	160 V – 4,400 V
Wave shape	
Rise time tr	1.0 µs
Pulse duration	50 µs
Short-circuit current	80 A – 2,200 A
Wave shape	
Rise time tr	6.4 µs
Pulse duration	16 µs
Polarity	Positive/negative/alternate
Output direct	HV-banana connector
Coupling network	L – N with Z = 2 Ω
	L-PE, N-PE, L+N-PE; Z = 12 Ω

VCS 500N8

Surge tester 8 kV

› Testing beyond the limits, 8 kV/4 kA, IEC 61000-4-5/-9
› Manual & remote operation
› Built-in single or 3-phase CDN

IEC 61000-4-5, IEC 61000-4-9, EN 300329, EN 300340, EN 300342-1, EN 300386 V1.3.2, EN 300386-2, EN 301489-1, EN 301489-7, EN 301489-17, EN 301489-24, EN 55024, ITU-T K.20, ITU-T K.21, ITU-T K.41, ITU-T K.45

TECHNICAL DATA (OVERVIEW)	
Surge as per IEC 61000-4-5	
Open-circuit voltage	250 V – 8,000 V
Wave shape	
Rise time tr	1.0 µs
Pulse duration	50 µs
Short-circuit current	125 A – 4,000 A
Wave shape	
Rise time tr	6.4 µs
Pulse duration	16 µs
Polarity	Positive/negative/alternate
Output direct	HV-banana connector
Coupling network	L – N with Z = 2 Ω
	L-PE, N-PE, L+N-PE; Z = 12 Ω

TRANSIENTS

Surge pulses occur due to direct or indirect lightning strikes to an external (outdoor) circuit. This leads to currents or electromagnetic fields causing high-voltage or current transients. Another source of surge pulses are switching transients originating from switching disturbances and system faults. Due to the characteristic of the phenomenon nearly every electrical and electronic device may suffer from such lightning events. Surge tests should therefore be widely performed. Surge voltage can reach several thousands of volts and surge current is seen to reach several thousands of amps.

VCS 500N10

Surge tester 10 kV

- Still compact in size but up to 10 kV/5 kA, IEC 61000-4-5/-9
- Manual & remote operation
- External CDNs for power mains and I/O line applications

IEC 61000-4-5, IEC 61000-4-9, EN 300329, EN 300340, EN 300342-1, EN 300386 V1.3.2, EN 300386-2, EN 301489-1, EN 301489-7, EN 301489-17, EN 301489-24, EN 55024, ITU-T K.20, ITU-T K.21, ITU-T K.41, ITU-T K.45

TECHNICAL DATA (OVERVIEW)	
Surge as per IEC 61000-4-5	
Open-circuit voltage	250 V – 10,000 V
Wave shape	
Rise time tr	1.0 µs
Pulse duration	50 µs
Short-circuit current	125 A – 5,000 A
Wave shape	
Rise time tr	6.4 µs
Pulse duration	16 µs
Polarity	Positive/negative/alternate
Output direct	HV-banana connector
Coupling network	External option

VCS 500N7T

Surge & telecom tester 7 kV

- IEC 61000-4-5, ITU
- 7.0 kV/3.5 kA surge & 7.0 kV telecom surge 10 µs/700 µs
- Built-in single-phase CDN

IEC 61000-4-5, IEC 61000-4-9, EN 300329, EN 300340, EN 300342-1, EN 300386 V1.3.2, EN 300386-2, EN 301489-1, EN 301489-7, EN 301489-17, EN 301489-24, EN 55024, ITU-T K.20, ITU-T K.21, ITU-T K.41, ITU-T K.45

TECHNICAL DATA (OVERVIEW)	
Surge as per IEC 61000-4-5	
Open-circuit voltage	250 V – 7,000 V
Wave shape	
Rise time tr	1,0 µs
Pulse duration	50 µs
Short-circuit current	125 A – 3,500 A
Wave shape	
Rise time tr	6.4 µs
Pulse duration	16 µs
Polarity	Positive/negative/alternate
Output direct	HV-banana connector
Coupling network	L – N with Z = 2 Ω
	L-PE, N-PE, L+N-PE; Z = 12 Ω
Telecom surge	250 V – 7,000 V
Front time	10 µs
Pulse duration	700 µs
Short-circuit current	6.0 – 175 A
Rise time tr	4 µs
Pulse duration	300 µs

TRANSIENTS

Telecommunication networks are exposed to lightning events. Therefore telecommunication equipment that is connected to the outside world needs to have appropriate protection that demonstrates an acceptable level of immunity to surge transients in order not to fail during lightning events. Telecom surge simulators of the TSS 500 series are used to test the immunity of telecommunication equipment.

TSS 500M4

Telecom surge tester 4 kV

› Compact telecom surge generator as per ITU
› Built-in 1.2/50 µs & 10/700 µs transients
› Built-in coupling network; 4 × 100 Ω and 2 × 25 Ω

FCC 97-270 (part 68), IEC 61000-4-5, ITU-T K.17, ITU-T K.20, ITU-T K.21, ITU-T K.28, ITU-T K.45

TECHNICAL DATA (OVERVIEW)	
Open-circuit voltage	160 V – 4,000 V
Telecom surge as per ITU K ...	
Wave shape	
Front time tf	1.2 µs
Duration td	50 µs
Wave shape open-circuit	
Front time tf	10 µs
Duration td	700 µs
Wave shape short-circuit current	4 – 100 A
Rise time tr	4 µs
Duration td	300 µs
Surge B as per FCC part 68	
Wave shape open-circuit	
Front time tf	9 µs
Duration td	720 µs
Wave shape short-circuit current	4 – 100 A
Rise time tr	5 µs
Duration td	320 µs

TSS 500M10

Telecom surge tester 10 kV

› Extra-high voltage telecom surge generator as per ITU
› Up to 10 kV peak voltage
› Built-in coupling network; 4 × 100 Ω and 2 × 25 Ω

FCC 97-270 (part 68), IEC 61000-4-5, ITU-T K.17, ITU-T K.20, ITU-T K.21, ITU-T K.28, ITU-T K.45

TECHNICAL DATA (OVERVIEW)	
Open-circuit voltage	500 V – 10,000 V
Telecom surge as per ITU K ...	
Wave shape	
Front time tf	1.2 µs
Duration td	50 µs
Wave shape open-circuit	
Front time tf	10 µs
Duration td	700 µs
Wave shape short-circuit current	12.5 – 250 A
Rise time tr	4 µs
Duration td	300 µs
Surge B as per FCC part 68	
Wave shape open-circuit	
Front time tf	9 µs
Duration td	720 µs
Wave shape short-circuit current	12.5 – 250 A
Rise time tr	5 µs
Duration td	320 µs

TRANSIENTS

The OCS 500M6 includes test capabilities for ring waves up to 6 kV and damped oscillatory waves at 100 kHz and 1 MHz up to 2.5 kV. A ring wave is a non-repetitive damped oscillatory transient occurring in low-voltage power, control and signal lines supplied by public and non-public networks. Damped oscillatory waves are repetitive transients mainly occurring in power, control and signal cables installed in high-voltage and medium-voltage stations. The OCS 500M6 can also be used to perform magnetic field tests as required in IEC 61000-4-10 using a magnetic field coil such as the MS 100.

OCS 500M6

Compact tester for ring wave and damped oscillatory waves

› 100 kHz ring wave & 100 kHz/1 MHz damped Oscillatory
› Conducted immunity and magnetic field test
› Built-in coupling network

ANSI/IEEE C37.90, ANSI/IEEE C62.41, IEC 60255-1, IEC 61000-4-10, IEC 61000-4-12, IEC 61000-4-18

TECHNICAL DATA (OVERVIEW)	
Damped oscillatory as per IEC 61000-4-18	
Output voltage open-circuit	250 V – 2,500 V
Rise time/Oscillation frequency 1/T	75 ns/100 kHz and 1 MHz
Decaying	Peak 5 must be › 50% of peak 1 value
	Peak 10 must be ‹ 50% of peak 1 value
Source impedance	200 Ω
Polarity	Positive/negative
Repetition rate	40/s for 100 kHz and 400/s for 1 MHz
Direct output at the front panel	For ext CDN & magn. field antenna
Coupling network	1-phase or 3-phase
Damped oscillatory magnetic field as per IEC 61000-4-10	MS 100 (square 1 m × 1 m) antenna
Ring wave as per IEC 61000-4-12	
Output voltage open-circuit	250 V – 6,000 V
Rise time first peak T1/Oscillation frequency	0.5 µs/100 kHz
Decaying of Pk1 to Pk2	40% – 110%
Decaying of Pk2 to Pk3 & decaying of Pk3 to Pk4	40% – 80%
Output impedance	12 Ω, 30 Ω (200 Ω external)
Wave shape short-circuit	
Rise time first peak tr T1	‹ 1 µs
Oscillation frequency 1/T	100 kHz

POWER MAINS SIMULATION

Electronic and electrical equipment may be affected by voltage dips, short interruptions and voltage variations of power supply. Dips and interruptions are caused by faults in the network or installations or by sudden large changes of load. Testing for such a phenomena is required in order to check that electronic and electrical equipment does not fall into unsafe operation conditions.

PFS 503SX

Simulator for dips, short interruptions and voltage variations

› True 3-phase voltage dip generator as per IEC 61000-4-11
› Dip mode, line(s) to neutral or line to line
› External variac for STAR and DELTA power mains systems

IEC 61000-4-11, IEC 61000-4-29, IEC 60601-1-2:2002, EN 61000-6-1, EN 61000-6-2

TECHNICAL DATA (OVERVIEW)	
AC voltage L-L	Max. 3 × 440 V
AC current	Max. 3 × 32/63/100 A
Frequency	50/60 Hz
AC voltage L-N	Max. 250 V
AC current	Max. 32, 63, 100 A
Frequency	50/60 Hz
DC voltage	Max. 250 V
DC current	Max. 32, 63, 100 A
Inrush current	› 500 A
	Short-circuit protected
Dip mode	Line to line
	Line to neutral
	Lines to neutral

CONDUCTED AND RADIATED IMMUNITY

The CWS 500N1 is the most compact single-box test equipment to test conducted rf immunity as per IEC 61000-4-6 and related standards. As well as 1 kHz 80% AM the CWS 500N1 also generates 2 Hz 80% AM to test medical appliances and 1 Hz PM with 50% duty cycle required to test safety equipment such as fire alarms. EM TEST supplies a large range of CDNs, EM clamps, current injection clamps and calibration accessories.

Bulk Current Injection (BCI) is a test procedure to test the immunity to electrical disturbances from narrowband electromagnetic energy. The test signal is injected by means of a current injection probe. In physical terms the current injection probe is a current transformer laid around the wiring harness. Immunity tests are performed varying the level and the frequency of the injected test signal. The BCI test method is widely known in the automotive industry as well as in the military/aircraft industry to test single components of a complex system.

CWS 500N1

The single-box solution for rf-conducted immunity testing

› RF-conducted immunity testing as per IEC 61000-4-6
› Up to 300 MHz test frequency
› Self-calibration procedures for CDNs and coupling clamps

IEC 61000-4-6, IEC 60601-1-2:2002, EN 300340, EN 300342- 1, EN 300386 V1.3.2, EN 301489-1, EN 301489-7, EN 301489-17, EN 301489-24, EN 55024, EN 61000-6-1, EN 61000-6-2, EN 300329

TECHNICAL DATA (OVERVIEW)	
Frequency range	9 kHz – 1 GHz (internal signal generator)
Modulation	AM 1 – 3,000 Hz, 0 – 95%
	PM 1 – 3,000 Hz
	Duty cycle 10% – 80%
With built-in amplifier	100 kHz – 300 MHz
Output level	1 – 30 Vrms after 6 dB-attenuator
Output power	80 W (nominal)
Output impedance	50 Ω
max. VSWR	1 : 1.2 at all phase angles and at max. power (without destruction)
Harmonic distortion	‹ 15 dBc
Preprogrammed modulation method	Amplitude modulation
	80% ‹ ±5%, 1 kHz ‹ ±10%
	80% ‹ ±5%, 2 Hz, 1 kHz
Pulse modulation	1 Hz, 50% duty cycle acc. to EN 50130-4

CWS 500N2

The single-box solution for rf-conducted immunity testing

› Compact simulator as per ISO 11452-4; EN 61000-4-6
› 10 kHz to 400 MHz, 100 W (expandable up to 1 GHz)
› System solution is fully designed and supported by EM TEST

IEC 61000-4-6, EN 61000-6-1, EN 61000-6-2, IEC 60601-1-2:2002, ISO 11452-4, ISO 11452-5, DaimlerChrysler DC-10614, Ford ES-XW7T-1A278-AB, Ford ESXW7T- 1A278-AC, GMW 3097 (2001), GMW 3097 (2004), MBN 10284-2:2002, PSA B21 7110, Renault 36.00.808/-D, Renault 36.00.808/-G, MIL STD 461D/CS 114, MIL STD 461E/CS 114, RTCA/DO 160 Section 20, Fiat 9.90110

TECHNICAL DATA (OVERVIEW)	
Output power	100 W (nominal)
Output impedance	50 Ω
Max. VSWR	1 : 2.0
Output level	-13 dBm – 50 dBm
Sinusoidal (CW)	10 kHz – 1,000 MHz
Modulation	AM 1 – 3,000 Hz, 0 – 95%
	PM 1 – 3,000 Hz
	Duty cycle 10% – 80%
Output	N-connector
Built-in power meter	Channel 1 forward power
	Channel 2 reverse power
	Channel 3 injected current
Built-in coupler	Max 200 W/1 GHz

CONDUCTED AND RADIATED IMMUNITY

The CWS 500N4 is the state-of-the-art solution in a compact one-box design to test for immunity to conducted, common mode disturbances in the frequency range 0 Hz (DC) to 150 kHhz. Such test requirements are specified in IEC 61000-4-16 and cover continuous mode testing as well as short term testing with DC, 16 2/3 Hz, 50 Hz and 60 Hz with 4 test levels each plus a sweep mode from 15 Hz to 150 kHz. Complemented by an AC voltage source and a motor variac, the CWS 500N4 forms a complete test system allowing the coupling of the disturbance signals onto the various types of lines by means of the specified coupling networks.

CWS 500N4

Compact simulator for conducted common-mode immunity testing.

› Compact simulator as per ISO 61000-4-16

› 15 Hz to 150 KHz

› System solution is fully designed and supported by EM TEST

IEC 60533, IEC 61000-4-16, IEC 61326, IEC 61543, IEC 61850-3, IEC 60255-22-7, IEC/EN 60870-5, EN 50121-4

TECHNICAL DATA (OVERVIEW)	
Test levels continuous	0.1 – 30 Vrms or DC
Test levels short-term	0.1 – 300 Vrms or DC, for 1 s duration
Test frequencies	DC, 16 2/3 Hz, 50 Hz and 60 Hz
Frequency range	15 Hz to 150 kHz (sweep mode)
Generator impedance	50 Ω
Build-in voltmeter	RMS measurement
Build-in rectifier	For DC testing

ELECTROSTATIC DISCHARGE

Electrostatic discharges either from a human body to any other part or between two different objects can cause persistent disturbances or even destruction to sensitive electronics or controls. Voltages of several thousand volts are generated. dito is the most advanced ESD tester to simulate ESD pulses as accurately as possible according to the latest standards.

DITO

The ultimate ESD tester

› Ergonomic design
› Modular concept
› Ease of handling

Bellcore GR-1089-Core, EN 300340, EN 300342-1, EN 300386 V1.3.2, EN 301489-1, EN 301489-7, EN 301489-17, EN 301489-24, EN 55024, IEC 61000-4-2, ITU-T K.20, ITU-T K.21, ITU-T K.45, ISO 10605, JASO D001-94, Chrysler PF 9326, DaimlerChrysler PF-10540, Fiat 9.90110, Ford WDR 00.00EA, Renault 36.00.400/B, Renault 36.00.400/C, Toyota TSC3500G, Toyota TSC3590G, Volvo EMC requirements (1998), EN 300329

TECHNICAL DATA (OVERVIEW)	
ESD as per IEC 61000-4-2	
Test voltage	0.5 – 16.5 kV
Discharge	Air/contact discharge
Polarity	Positive/negative
Hold-on time	› 5 s
R/C parameter	150 pF/330 Ω
Specification contact discharge	500 V to 10 kV
Rise time tr	0.7 – 1 ns
Peak of discharge currents	3.75 A/kV
ESD as per ISO 10605	
Test voltage	0.5 – 16.5 kV
Discharge	Air/contact discharge
Polarity	Positive/negative
R/C parameters	100 pF/1,500 Ω
	150 pF/330 Ω
	330 pF/330 Ω
	150 pF/2,000 Ω
	330 pF/2,000 Ω
Specification contact discharge	500 V to 10 kV
Rise time tr	0.7 – 1 ns
Peak of discharge currents	3.75 A/kV

ESD 30N

ESD tester up to 30 kV

› Up to 30 kV contact & air discharge
› Interchangeable discharge networks
› For automotive, commercial and military applications

IEC 61000-4-2, ISO 10605, SAE J1113-13, SAE J1455, BMW 600 13.0 (Part 2), BMW GS 5002 (1999), DaimlerChrysler DC-10613, DaimlerChrysler DC-10614, Mercedes AV EMV, Ford ES-XW7T-1A278-AB, GMW 3097, GMW 3097 (2001), GMW 3100, GMW 3100 (2001), Mazda MES PW 67600, Mitsubishi ES-X82010, Nissan 28401 NDS 02, Porsche, PSA B21 7110, Renault 36.00.808/-D, Renault 36.00.808/-E, Renault 36.00.808/-F, Smart DE1005B, VW TL 824 66, MBN 10284-2:2002, Renault 36.00.808/-G

TECHNICAL DATA (OVERVIEW)	
ESD as per IEC 61000-4-2 and ISO 10605	
Test voltage	Max. 30 kV
Discharge	Air/contact discharge
Polarity	Positive/negative
Hold-on time	› 5 s
Specification contact discharge	0.2 – 30 kV
Rise time tr	0.7 – 1 ns
Peak of discharge currents	3.75 A/kV
R/C parameters	150pF/330 Ω –– 330pF/330 Ω
	150pF/2,000 Ω –– 330pF/2,000 Ω
	100pF/1,500 Ω –– customized
Special technical highlights	
- RC network values indicated on the LCD	
- AD or CD discharge mode indicated on the LCD	
- Active discharge finger control	
- Bleed-off function to discharge the EUT	
- Temperature and humidity sensor included	
- USB or optical interface included	
- esd.control software	
- Power supply: AC (88 – 250 V), DC (11 – 16 V)	
- Battery mode included for several hours	

HARMONICS & FLICKER

Harmonics and interharmonics are caused by modern electronic power conditioning modules. Such modules (mostly nonlinear) to control loads and reduce power consumption are the source of voltage at unwanted frequencies superimposed on the supply voltage. Voltage fluctuations caused by varying load currents may influence luminance or spectral distribution of lighting systems. The impression of unsteadiness of visual sensation induced by this light stimulus is called flicker. Flicker also needs to be limited to a minimum. The DPA 500N is used for single-phase applications and the DPA 503 is used for 3-phase applications but also supports single-phase applications. ACS 500N is a single-phase and the ACS 503 a 3-phase AC source, specially designed for harmonics and flicker testing.
It meets the corresponding specifications as per IEC/EN 61000-3-2 and IEC/EN 61000-3-3. It provides the perfect sinusoidal and stable voltage signal specified to give fully compliant harmonics and flicker analyses irrespective of the mains supply frequency and steadiness of the voltage.

DPA 500N

Single-phase power analyser, H&F analyser

› Single-phase harmonics/flicker analyser
› Built-in single-phase flicker impedance
› Real-time analysis using internal computer and DSP

IEC 61000-3-2, IEC 61000-3-3, IEC 61000-3-11, IEC 61000-3-12, IEC 61000-4-7, IEC 61000-4-15, IEC 60601-1-2:2002, EN 61000-6-1, EN 61000-6-2, EN 301489-1, EN 301489-7, EN 301489-17, EN 301489-24, EN 300386-2, EN 61000-3-2, EN 61000-3-3, EN 61000-3-11, EN 61000-3-12, EN 61000-4-7, EN 61000-4-15, JIS C 61000-3-2

TECHNICAL DATA (OVERVIEW)	
Input channels	2 (1 × current & voltage)
EUT connection	1-phase
A/D converter	16 bit
Class of instrument	Class A as per IEC/EN 61000-4-7, ed. 2
Voltage input	10 – 530 Vrms
Overload	4,000 V peak
Current input	50 A
Input range internal	50 A peak – 16 A continuous
Input range external	Standard delivered model max. 140 A (factory setting 2 turns 70 A)
Harmonic analysis	IEC/EN 61000-3-2 and IEC/EN 61000-3-12, according to IEC/EN 61000-4-7
Harmonic range	1 – 50th harmonic
Grouping	Interharmonics acc. to IEC/EN 61000-4-7, ed. 2
Display	Urms, irms, ipeak, upeak, P, Q, S, power Factor, THD(U), THD(I), crest factor(u), crest factor(i)
Flicker analysis	IEC/EN 61000-3-3 and IEC/EN 61000-3-11, according to IEC/EN 61000-4-15
Flicker data	P_{st} and P_{lt}, Vrms, dmax, dc, dt, P50, P10, P3, P1, P0.1
Flicker impedance: Phase | Neutral	0.24 Ω + j 0.15 Ω | 0.16 Ω + j 0.10 Ω

ACS 500N

Single-phase AC voltage source up to 6 kVA

› AC power source up to 300 V/20 A single phase
› Large inrush current capability
› Controlled by DPA 500 and ISMDPA software

IEC 61000-3-2, IEC 61000-3-3, EN 61000-3-2, EN 61000-3-3, IEC 61000-3-11

TECHNICAL DATA (OVERVIEW)	
ACS 500N6	
Voltage range	0 to 300 V
Voltage resolution	0.025% (12 bit)
Output frequency	10 Hz to 80 Hz
Output power	6,000 VA
Output connector	Safety banana-plug
ACS 500N2	
Voltage range	0 to 300 V
Voltage resolution	0.025% (12 bit)
Output frequency	10 Hz to 80 Hz
Output power	2,000 VA
Output connector	Safety banana-plug

DPA 503

3-phase power analyser, H&F analyser

› Three-phase harmonics/flicker analyser
› External three-phase flicker impedance AIF 503
› Real-time analysis using internal computer and DSP

IEC 61000-3-2, IEC 61000-3-3, IEC 61000-3-11, IEC 61000-3-12, IEC 61000-4-7, IEC 61000-4-15, IEC 60601-1-2:2002, EN 61000-6-1, EN 61000-6-2, EN 301489-1, EN 301489-7, EN 301489-17, EN 301489-24, EN 300386-2, EN 61000-3-2, EN 61000-3-3, EN 61000-4-7, EN 61000-4-15, EN 61000-3-11, EN 61000-3-12
JIS C 61000-3-2

TECHNICAL DATA (OVERVIEW)	
Input channels	6 (3 × current & voltage)
EUT connection	3-phase
A/D converter	16 bit
Class of instrument	Class A as per IEC/EN 61000-4-7 ed.2
Voltage input	10 – 530 Vrms
Overload	4,000 V peak
Current input	Depends on CT model used
Input range	Standard delivered model max. 140 A (factory setting 2 turns 70 A)
Harmonic analysis	IEC/EN 61000-3-2 and IEC/EN 61000-3-12, according to IEC/EN 61000-4-7
Harmonic range	1 – 50th harmonic
Grouping	Interharmonics acc. to IEC/EN 61000-4-7, ed. 2
Display	Urms, irms, upeak, ipeak, P, Q, S, power factor, THD(U), THD(I), crest factor(u), crest factor(i)
Flicker analysis	IEC/EN 61000-3-3 and IEC/EN 61000-3-11, according to IEC/EN 61000-4-15
Flicker data	P_{st} and P_{lt}, Vrms, dmax, dc, dt, P50, P10, P3, P1, P0.1

ACS 503

Single-phase AC voltage source 20 kVA

› AC power source for three-phase up to 20 kVA
› Large inrush current capability
› Controlled by DPA 503 and ISMDPA software

IEC 61000-3-2, IEC 61000-3-3, IEC 61000-3-11, IEC 61000-3-12, EN 61000-3-2, EN 61000-3-3, EN 61000-3-11, EN 61000-3-12

TECHNICAL DATA (OVERVIEW)	
Voltage range	0 to 300 V
Voltage resolution	0.025% (12 bit)
Output frequency	40 Hz to 80 Hz
Output power	20,000 VA
Output connector	3-phase CEE-connector

AIF 503

3-phase flicker impedance 16 A

› Flicker impedance as per IEC 60725
› For flicker analysis as per IEC 61000-3-3
› For 3-phase EUT up to 16 A nominal current

IEC 61000-3-3, IEC 61000-3-11, EN 61000-3-3, EN 61000-3-11, IEC 60725

TECHNICAL DATA (OVERVIEW)	
Phase	3-phase
Z ref	R_A = 0.24 Ω X_A = 0.15 Ω
	R_N = 0.16 Ω X_N = 0.10 Ω
Z test	Not available
Accuracy Zref, Ztest	‹ 3%
EUT power supply	
Line voltage	3 × 400 V
Line current	16 A pro phase max.
Line frequency	47 – 63 Hz

AIF 503S1

3-phase flicker impedance 32 A

› Flicker impedance as per IEC 60725
› For flicker analysis as per IEC 61000-3-3
› Built-in Zref and Ztest

IEC 61000-3-3, IEC 61000-3-11, EN 61000-3-3, EN 61000-3-11, IEC 60725

TECHNICAL DATA (OVERVIEW)	
Phase	3-phase
Z ref	R_A = 0.24 Ω X_A = 0.15 Ω
	R_N = 0.16 Ω X_N = 0.10 Ω
Z test	R_A = 0.15 Ω X_A = 0.15 Ω
	R_N = 0.10 Ω X_N = 0.10 Ω
Accuracy Z ref, Z test	‹ 3%
EUT power supply	
Line voltage	3 × 400 V
Line current	32 A pro phase max.
Line frequency	47 – 63 Hz

DOWNLOAD THE COMPLETE TECHNICAL DATA:

www.emtest.com

COMPONENTS & SAFETY

OVERVIEW					
Application	**Surge**	**Telecom Surge**	**Oscillatory**	**Current Surge**	**Safety**
Products	UCS 500Nx VCS 500Nx	TSS 500Mx TSS 500M6B	OCS 500M6	CSS 500N2 CSS 500N10	VSS 500N12 VSS 500N12S2 VSS 500N6
Standards	IEC 61000-4-5	ITU K ... Bellcore	IEC 61000-4-12	Protection devices	IEC 60065 UL 6500

TRANSIENTS, RADIATED IMMUNITY AND POWER MAINS SIMULATION

The UCS 500N4/UCS 500N7 Ultra Compact Simulator is the most versatile tester to cover transient and power-fail requirements according to international standards (basic and generic standards) and product family standards with voltage capability of up to 7 kV. In addition to the IEC 61000-4-5 standard for surge testing it also complies with ANSI/IEEE C62.41 for surge and ring wave testing.

The UCS 500N7 is the most economical test solution for fully compliant immunity tests and CE marking. Having a built-in CDN for single-phase EUT up to 300 V and max. 16 A. It can be extended for testing three-phase EUTs by means of an automatically controlled external coupling network up to 690 V with max. 100 A.
EM TEST supplies a large range of accessories for the various applications.

UCS 500N4

Compact tester for EFT/burst, surge and power fail

› Small and compact all-in-one tester
› IEC 61000-4-4/-5/-8/-9/-11/-29
› Built-in single-phase CDN

IEC 61000-4-4, IEC 61000-4-5, IEC 61000-4-8, IEC 61000-4-9, IEC 61000-4-11, IEC 61000-4-29, EN 61000-6-1, EN 61000-6-2, EN 55024, EN 300340, EN 300342-1, EN 300386 V1.3.2, EN 301489-1, EN 301489-7, EN 301489-17, EN 301489-24, ITU-T K.20, ITU-T K.21, ITU-T K.41, ITU-T K.45, EN 300329

TECHNICAL DATA (OVERVIEW)	
EFT as per IEC 61000-4-4, ed. 2	
Open-circuit	200 V – 4,400 V
Rise time tr	5 ns
Pulse duration td	50 ns
Source impedance	Zq = 50 Ω
Polarity	Positive/negative
Surge as per IEC 61000-4-5	
Open-circuit voltage 1.2/50 µs	160 V – 4,000 V
Short-circuit current 8/20 µs	80 A – 2,000 A
Polarity	Positive/negative/alternate
Mag. field as per IEC 61000-4-9	100, 300, 1,000 A/m
Dips as per IEC 61000-4-11	
AC voltage/current	Max. 250 V/16 A
Inrush current	More than 500 A
Mag. field as per IEC 61000-4-8	1, 3, 10 and 30 A/m with MC 2630 100, 300 and 1,000 A/m with MC26100
Telecom surge as per IEC 61000-4-5	
Open-circuit 10/700 µs	160 V – 4,000 V
Short-circuit current 4/300 µs	4 A – 100 A

UCS 500N7

Compact tester for EFT/burst, surge, ring wave and power fail

› Testing beyond the limits, 5.5 kV EFT & 7 kV surge
› Optional RWG module as per 61000-4-12
› Manual & remote operation

IEC 61000-4-4, IEC 61000-4-5, IEC 61000-4-8, IEC 61000-4-9, IEC 61000-4-11, IEC 61000-4-12, IEC 61000-4-29, EN 61000-6-1, EN 61000-6-2, ITU-T K.20, ITU-T K.21, ITU-T K.45, Bellcore GR-1089-Core, ANSI/IEEE C62.41, EN 61543, IEC 61008-1, IEC 61009-1

TECHNICAL DATA	
EFT as per IEC 61000-4-4, ed. 2	
Open-circuit	200 V – 5,500 V
Rise time tr	5 ns
Pulse duration td	50 ns
Source impedance	Zq = 50 Ω
Polarity	Positive/negative
Surge as per IEC 61000-4-5	
Open-circuit voltage 1.2/50 µs	250 V – 7,000 V
Short-circuit current 8/20 µs	125 A – 3,500 A
Polarity	Positive/negative/alternate
Mag. field as per IEC 61000-4-9	100, 300, 1,000 A/m
Dips as per IEC 61000-4-11	
AC voltage/current	Max. 300 V/16 A
Inrush current	More than 500 A
Mag. field as per IEC 61000-4-8	1, 3, 10 and 30 A/m with MC 2630 100, 300 and 1,000 A/m with MC26100
Ring wave as per IEC 61000-4-12	
Open-circuit voltage 0.5 µs/100 kHz	6,000 V with 12 Ω and 30 Ω source impedance
Telecom surge as per IEC 61000-4-5	
Open-circuit 10/700 µs	250 V – 7,000 V
Short-circuit current 4/300 µs	6 A – 175 A

TRANSIENTS

Surge pulses occur due to direct or indirect lightning strikes to an external (outdoor) circuit. This leads to currents or electromagnetic fields causing high-voltage or current transients. Another source of surge pulses are switching transients originating from switching disturbances and system faults. Due to the characteristic of the phenomenon nearly every electrical and electronic device may suffer from such lightning events. Surge tests should therefore be widely performed. Surge voltage can reach several thousands of volts and surge current is seen to reach several thousands of amps.

VCS 500N4

Surge tester 4.4 kV

› 4.4 kV/2.2 kA surge, IEC 61000-4-5/-9
› Preprogrammed standard test routines included
› Built-in single-phase CDN

IEC 61000-4-5, IEC 61000-4-9, EN 300329, EN 300340, EN 300342-1, EN 300386 V1.3.2, EN 300386-2, EN 301489-1, EN 301489-7, EN 301489-17, EN 301489-24, EN 55024, ITU-T K.20, ITU-T K.21, ITU-T K.41, ITU-T K.45

TECHNICAL DATA (OVERVIEW)	
Surge as per IEC 61000-4-5	
Open-circuit voltage	160 V – 4,400 V
Wave shape	
Rise time tr	1.0 µs
Pulse duration	50 µs
Short-circuit current	80 A – 2,200 A
Wave shape	
Rise time tr	6.4 µs
Pulse duration	16 µs
Polarity	Positive/negative/alternate
Output direct	HV-banana connector
Coupling network	L – N with Z = 2 Ω
	L-PE, N-PE, L+N-PE; Z = 12 Ω

VCS 500N8

Surge tester 8 kV

› Testing beyond the limits, 8 kV/4 kA, IEC 61000-4-5/-9
› Manual & remote operation
› Built-in single or 3-phase CDN

IEC 61000-4-5, IEC 61000-4-9, EN 300329, EN 300340, EN 300342-1, EN 300386 V1.3.2, EN 300386-2, EN 301489-1, EN 301489-7, EN 301489-17, EN 301489-24, EN 55024, ITU-T K.20, ITU-T K.21, ITU-T K.41, ITU-T K.45

TECHNICAL DATA (OVERVIEW)	
Surge as per IEC 61000-4-5	
Open-circuit voltage	250 V – 8,000 V
Wave shape	
Rise time tr	1.0 µs
Pulse duration	50 µs
Short-circuit current	125 A – 4,000 A
Wave shape	
Rise time tr	6.4 µs
Pulse duration	16 µs
Polarity	Positive/negative/alternate
Output direct	HV-banana connector
Coupling network	L – N with Z = 2 Ω
	L-PE, N-PE, L+N-PE; Z = 12 Ω

VCS 500N10

Surge tester 10 kV

› Still compact in size but up to 10 kV/5 kA, IEC 61000-4-5/-9
› Manual & remote operation
› External CDNs for power mains and I/O line applications

IEC 61000-4-5, IEC 61000-4-9, EN 300329, EN 300340, EN 300342-1, EN 300386 V1.3.2, EN 300386-2, EN 301489-1, EN 301489-7, EN 301489-17, EN 301489-24, EN 55024, ITU-T K.20, ITU-T K.21, ITU-T K.41, ITU-T K.45

TECHNICAL DATA (OVERVIEW)	
Surge as per IEC 61000-4-5	
Open-circuit voltage	250 V – 10,000 V
Wave shape	
Rise time tr	1.0 µs
Pulse duration	50 µs
Short-circuit current	125 A – 5,000 A
Wave shape	
Rise time tr	6.4 µs
Pulse duration	16 µs
Polarity	Positive/negative/alternate
Output direct	HV-banana connector
Coupling network	External option

VCS 500N12

Surge tester 12 kV

› Still compact in size but up to 12 kV/6 kA, IEC 61000-4-5/-9
› Manual & remote operation
› External CDNs for power mains and I/O line applications

IEC 61000-4-5, IEC 61000-4-9, EN 300329, EN 300340, EN 300342-1, EN 300386 V1.3.2, EN 300386-2, EN 301489-1, EN 301489-7, EN 301489-17, EN 301489-24, EN 55024, ITU-T K.20, ITU-T K.21, ITU-T K.41, ITU-T K.45

TECHNICAL DATA (OVERVIEW)	
Surge as per IEC 61000-4-5	
Open-circuit voltage	500 V – 12,000 V
Wave shape	
Rise time tr	1.0 µs
Pulse duration	50 µs
Short-circuit current	250 A – 6,000 A
Wave shape	
Rise time tr	6.4 µs
Pulse duration	16 µs
Polarity	Positive/negative/alternate
Output direct	HV-banana connector
Coupling network	External option

TRANSIENTS

Telecommunication networks are exposed to lightning events. Therefore telecommunication equipment that is connected to the outside world needs to have appropriate protection that demonstrates an acceptable level of immunity to surge transients in order not to fail during lightning events. Telecom surge simulators of the TSS 500 series are used to test the immunity of telecommunication equipment.

VCS 500N7T

Surge & telecom tester 7 kV

› IEC 61000-4-5, ITU

› 7.0 kV/3.5 kA surge & 7.0 kV telecom surge 10 µs/700 µs

› Built-in single-phase CDN

IEC 61000-4-5, IEC 61000-4-9, EN 300329, EN 300340, EN 300342-1, EN 300386 V1.3.2, EN 300386-2, EN 301489-1, EN 301489-7, EN 301489-17, EN 301489-24, EN 55024, ITU-T K.20, ITU-T K.21, ITU-T K.41, ITU-T K.45

TSS 500M4

Telecom surge tester 4 kV

› Compact telecom surge generator as per ITU

› Built-in 1.2/50 µs & 10/700 µs transients

› Built-in coupling network; 4 × 100 Ω and 2 × 25 Ω

FCC 97-270 (part 68), IEC 61000-4-5, ITU-T K.17, ITU-T K.20, ITU-T K.21, ITU-T K.28, ITU-T K.45

TECHNICAL DATA (OVERVIEW)	
Surge as per IEC 61000-4-5	
Open-circuit voltage	250 V – 7,000 V
Wave shape	
Rise time tr	1,0 µs
Pulse duration	50 µs
Short-circuit current	125 A – 3,500 A
Wave shape	
Rise time tr	6.4 µs
Pulse duration	16 µs
Polarity	Positive/negative/alternate
Output direct	HV-banana connector
Coupling network	L – N with Z = 2 Ω
	L-PE, N-PE, L+N-PE; Z = 12 Ω
Telecom surge	250 V – 7,000 V
Front time	10 µs
Pulse duration	700 µs
Short-circuit current	6.0 – 175 A
Rise time tr	4 µs
Pulse duration	300 µs

TECHNICAL DATA (OVERVIEW)	
Open-circuit voltage	160 V – 4,000 V
Telecom surge as per ITU K ...	
Wave shape	
Front time tf	1.2 µs
Duration td	50 µs
Wave shape open-circuit	
Front time tf	10 µs
Duration td	700 µs
Wave shape short-circuit current	4 – 100 A
Rise time tr	4 µs
Duration td	300 µs
Surge B as per FCC part 68	
Wave shape open-circuit	
Front time tf	9 µs
Duration td	720 µs
Wave shape short-circuit current	4 – 100 A
Rise time tr	5 µs
Duration td	320 µs

TSS 500M10

Telecom surge tester 10 kV

› Extra-high voltage telecom surge generator as per ITU
› Up to 10 kV peak voltage
› Built-in coupling network; 4 × 100 Ω and 2 × 25 Ω

FCC 97-270 (part 68), IEC 61000-4-5, ITU-T K.17, ITU-T K.20, ITU-T K.21, ITU-T K.28, ITU-T K.45

TECHNICAL DATA (OVERVIEW)	
Open-circuit voltage	500 V – 10,000 V
Telecom surge as per ITU K ...	
Wave shape	
Front time tf	1.2 µs
Duration td	50 µs
Wave shape open-circuit	
Front time tf	10 µs
Duration td	700 µs
Wave shape short-circuit current	12.5 – 250 A
Rise time tr	4 µs
Duration td	300 µs
Surge B as per FCC part 68	
Wave shape open-circuit	
Front time tf	9 µs
Duration td	720 µs
Wave shape short-circuit current	12.5 – 250 A
Rise time tr	5 µs
Duration td	320 µs

TSS 500M6B

Telecom surge tester

› Compact telecom surge generator as per GR 1089
› All 10/360 µs, 10/1,000 µs and 2/10 µs included
› Built-in resistive coupling network

Bellcore GR-1089-Core, ITU-T K.12, ITU-T K.28, ITU-T K.45

TECHNICAL DATA (OVERVIEW)	
First-level lightning	
Pulse 10/1,000 µs with 6 Ω	› 1,000 V & 167 A per conductor
Rise time tr/Pulse duration td	‹ 10 µs/› 1,000 µs
Pulse 10/360 µs with 10 Ω	› 1,000 V & 100 A per conductor
Rise time tr/Pulse duration td	‹ 10 µs/› 360 µs
Pulse 10/1,000 µs with 10 Ω	› 1,000 V & 100 A per conductor
Rise time tr/Pulse duration td	‹ 10 µs/› 1,000 µs
Pulse 2/10 µs with 5 Ω	› 2,500 V & 500 A per conductor
Rise time tr/Pulse duration td	‹ 2 µs/› 10 µs
Pulse 10/360 µs with 40 Ω	› 1,000 V & 25 A per conductor
Rise time tr/Pulse duration td	‹ 10 µs/› 360 µs
Intra-building lightning	
Pulse 2/10 µs with 8 Ω	› 2,500 V & 312 A per conductor
Rise time tr/Pulse duration td	‹ 2 µs/› 10 µs
Pulse 2/10 µs with 15 Ω	› 2,500 V & 167 A per conductor
Rise time tr/Pulse duration td	‹ 2 µs/› 10 µs
Second-level lightning	
Pulse 2/10 µs with 10 Ω	› 5,000 V & 500 A per conductor
Rise time tr/Pulse duration td	‹ 2 µs/› 10 µs
DUT supply 60 V/50 A	1 µs – 10 µs

TRANSIENTS

The OCS 500M6 includes test capabilities for ring waves up to 6 kV and damped oscillatory waves at 100 kHz and 1 MHz up to 2.5 kV. A ring wave is a non-repetitive damped oscillatory transient occurring in low-voltage power, control and signal lines supplied by public and non-public networks. Damped oscillatory waves are repetitive transients mainly occurring in power, control and signal cables installed in high-voltage and medium-voltage stations. The OCS 500M6 can also be used to perform magnetic field tests as required in IEC 61000-4-10 using a magnetic field coil such as the MS 100.

OCS 500M6

Compact tester for ring wave and damped oscillatory waves

› 100 kHz ring wave & 100 kHz/1 MHz damped Oscillatory
› Conducted immunity and magnetic field test
› Built-in coupling network

ANSI/IEEE C37.90, ANSI/IEEE C62.41, IEC 60255-1, IEC 61000-4-10, IEC 61000-4-12, IEC 61000-4-18

TECHNICAL DATA (OVERVIEW)	
Damped oscillatory as per IEC 61000-4-18	
Output voltage open-circuit	250 V – 2,500 V
Rise time/Oscillation frequency 1/T	75 ns/100 kHz and 1 MHz
Decaying	Peak 5 must be › 50% of peak 1 value
	Peak 10 must be ‹ 50% of peak 1 value
Source impedance	200 Ω
Polarity	Positive/negative
Repetition rate	40/s for 100 kHz and 400/s for 1 MHz
Direct output at the front panel	For ext CDN & magn. field antenna
Coupling network	1-phase or 3-phase
Damped oscillatory magnetic field as per IEC 61000-4-10	MS 100 (square 1 m × 1 m) antenna
Ring wave as per IEC 61000-4-12	
Output voltage open-circuit	250 V – 6,000 V
Rise time first peak T1/Oscillation frequency	0.5 µs/100 kHz
Decaying of Pk1 to Pk2	40% – 110%
Decaying of Pk2 to Pk3 & decaying of Pk3 to Pk4	40% – 80%
Output impedance	12 Ω, 30 Ω (200 Ω external)
Wave shape short-circuit	
Rise time first peak tr T1	‹ 1 µs
Oscillation frequency 1/T	100 kHz

CURRENT SURGE

Surge pulses occur due to direct or indirect lightning strikes to an external (outdoor) circuit. This leads to currents or electromagnetic fields causing high-voltage or current transients. Another source of surge pulses are switching transients originating from switching disturbances and systems faults. Due to the characteristic of the phenomenon nearly every electrical and electronic device may suffer from such lightning events. Surge tests should therefore be widely performed also on component level.

CSS 500N2

Current surge tester

› Current surge generator 8/20 µs or 10/1,000 µs
› Low current ranges to test SMD protection devices
› EUT test box available

TECHNICAL DATA (OVERVIEW)	
Charging voltage	100 – 2,500 V
Short-circuit current	1,200 A
Range I	1 – 18 A
Range II	6 – 140 A
Range III	40 – 1,200 A
Wave shape	
Rise time tr	8.0 µs
Pulse duration	20 µs
Polarity	Positive/negative/alternate
Output direct	HV-connector
	HV test clamp
	EUT test box
	Other waveforms on request

CSS 500N10

Current surge tester

› Current surge generator 8/20 µs or 10/1,000 µs
› High current capability up to 10 kA
› Voltage/current measurement included

TECHNICAL DATA (OVERVIEW)	
Charging voltage	250 – 6,000 V
Short-circuit current	10,000 A
Wave shape	
Rise time tr	8.0 µs
Pulse duration	20 µs
Polarity	Positive/negative/alternate
Output direct	HV-banana connector
	EUT test box
	Other waveforms on request

SAFETY

The voltage surge simulator VSS 500N12 generates high-voltage transients as required by several IEC standards. The voltage surge pulses are used to test the isolation (voltage withstand) capability of components, sockets, connectors, cables and many other items.
As per safety test requirements the insulation between accessible parts or parts connected to them and hazardous live parts must be able to withstand surges due to transients caused, e.g. by thunderstorms and entering the apparatus through the antenna terminal.

VSS 500N12

Voltage surge simulation

› Testing equipment safety up to 12 kV
› Internal 40 Ω or 500 Ω resistor for current limiting
› Manual & remote operation

IEC 60060, IEC 384-14, IEC 664

TECHNICAL DATA (OVERVIEW)	
Open-circuit voltage	500 V – 12,000 V
Rise time tr	1.2 µs
Pulse duration	50 µs
Internal resistor	Options are 40 Ω or 500 Ω
Polarity	Positive/negative/alternate

The voltage surge simulator VSS 500N10 generates high-voltage transients as required by IEC 60065 and UL 6500 standards for safety tests on audio, video and similar electronic apparatus.

VSS 500N10

Voltage surge simulation

› Testing equipment safety up to 10 kV
› Special pulse-shaping network
› Manual & remote operation

IEC 60065, UL 6500

TECHNICAL DATA (OVERVIEW)	
Open-circuit voltage	500 V – 10,000 V
Rise time tr	‹ 100 ns
Pulse duration	› 2 ms
Internal resistor	1,000 Ω
Polarity	Positive

VSS 500N6

Surge tester 6 kV for safety testing of “Protection Relays”

› Compact in size
› Manual & remote operation
› Constant energy

IEC 60255-5

TECHNICAL DATA (OVERVIEW)	
Surge as per IEC 60255-5	
Open-circuit voltage	150 V – 6,600 V
Wave shape	
Rise time tr	1.2 µs
Pulse duration	50 µs
Internal impedance	500 Ω
Energy	0.5 J at each test level
Test level	0.55 kV – 0.9 kV – 3.0 kV – 5.0 kV – 6.6 kV
Polarity	Positive/negative/alternate
Output direct	HV-banana connector

VCS 500N12.1

Surge tester 12 kV for safety testing “Household Appliances”

› Still compact in size but up to 12 kV/1 kA
› Manual & remote operation
› External CDNs for power mains and I/O line applications

IEC 61000-4-5, IEC 60335-1, IEC 61180-1, IEC 61180-2

TECHNICAL DATA (OVERVIEW)	
Surge as per IEC 61000-4-5	
Open-circuit voltage	500 V – 12,000 V
Wave shape	
Rise time tr	1.0 µs
Pulse duration	50 µs
Short-circuit current	41.7 A – 1,000 A
Wave shape	
Rise time tr	6.4 µs
Pulse duration	16 µs
Polarity	Positive/negative/alternate
Output direct	HV-banana connector
Coupling network	External option

AIRCRAFT
MILITARY

OVERVIEW				
Application	**Conducted Immunity**	**Radiated Immunity**	**Electrostatic Discharge**	**Power Mains Supply Simulation**
Products	CWS 500N3 CWS 500N2	CWS 500N3 CWS 500N2	dito ESD 30N	AutoWave VDS 200Nx
Standards	MIL STD 461 DO 160	MIL STD 461 DO 160	MIL STD 461 DO 160	DO 160 Section 16

BATTERY SIMULATION

The VDS 200N series is used to simulate the various battery supply waveforms recommended by the DO 160 aircraft standard and associated manufacturer standards.
The VDS 200N series has normally a nominal DC voltage output of 60 V. To cover the max test level required in DO 160 the generators can be extended to a 80 V nominal output voltage.

AutoWave is used for the following applications:
- Generation of all kinds of voltage profile via software
- Replay of imported data or plot files, record & play
- Recording voltage variations in the real vehicle
- Replaying the measured data via a suitable DC source or amplifier
- Analysis of the recorded voltages and currents
- Export of measured data to other software tools

VDS 200N

Battery supply simulator and DC voltage source

- Stand-alone, programmable DC source
- Manual & remote operation
- 60 V – 80 V/15 A – 200 A

DO 160

AUTOWAVE

Signal generator and recorder

- Simulating + measuring + analysing
- 16 bit resolution, 40 GByte hard disk memory
- Simultaneous record & play function

DO 160 section 16 requirements

TECHNICAL DATA (OVERVIEW)	
Voltage range	0 V – 60 V with 0.1 V steps
VDS 200N15	I = 0 A – 15 A cont.
VDS 200N30	I = 0 A – 30 A cont.
Inrush current	I = 70 A for 500 ms
VDS 200N30.2	80 V/30 A/70 peak
VDS 200N50	I = 0 A – 50 A cont.
Inrush current	I = 100 A for 500 ms
VDS 200N100	I = 0 A – 100 A cont.
Inrush current	I = 150 A for 500 ms
VDS 200N150	I = 0 A – 150 A cont.
VDS 200N200	I = 0 A – 200 A cont.
VDS 200N200.1	I = 0 A – 200 A cont.
Inrush current	I = 1,000 A for 100 ms
Preprogrammed wave shapes	as per section 16 of DO 160
Zq = < 10 mΩ	

TECHNICAL DATA (OVERVIEW)
Wave generation
2 output channels standard
4 output channel optional
Output ±10 V/50 Ω
Resolution 16 bit
DC – 50 kHz
Sample rate 500 kHz
Waveform segments
DC voltage
Sine wave
Sine wave sweep
Sine ramped
Square wave
Triangular wave
Saw-tooth wave
Ramp up/Ramp down
Exponential wave
Wave record
2-channel measuring input
±5 V, 10 V, 20 V, 50 V, 100 V

CONDUCTED AND RADIATED IMMUNITY

Bulk Current Injection (BCI) is a test procedure to test immunity to electrical disturbances caused by narrowband electromagnetic energy. The test signal is injected by means of a current injection probe. In physical terms the current injection probe is a current transformer laid around the wiring harness. Immunity tests are performed varying the level and the frequency of the injected test signal. The BCI test method is widely known in the automotive industry as well as in the military/aircraft industry to test single components of a complex system.

The CWS 500N3 is a state-of-the-art solution in a compact one-box design to test immunity to conducted audio frequency disturbances and low-frequency magnetic fields. The CWS 500N3 includes signal generator, LF amplifier, coupling transformer, frequency selective current and voltage monitor, software and GPIB interface.
ICD software supports the test routines, controls external measuring devices and automatically generates test reports with all test data included.

CWS 500N2

Bulk Current Injection (BCI) testing

› Bulk current injection as per MIL 461B
› 10 kHz to 400 MHz, 100 W (expandable up to 1 GHz)
› System solution is fully designed and supported by EM TEST

IEC 61000-4-6, EN 61000-6-1, EN 61000-6-2, IEC 60601-1-2:2002, ISO 11452-4, ISO 11452-5, DaimlerChrysler DC-10614, Ford ES-XW7T-1A278-AB, Ford ESXW7T-1A278-AC, GMW 3097 (2001), GMW 3097 (2004), MBN 10284-2:2002, PSA B21 7110, Renault 36.00.808/-D, Renault 36.00.808/-G, MIL STD 461D/CS 114, MIL STD 461E/CS 114, RTCA/DO 160 Section 20, Fiat 9.90110

TECHNICAL DATA (OVERVIEW)	
BCI method	MIL 461B CS114
Output power	100 W (nominal)
Output impedance	50 Ω
Max. VSWR	1 : 2.0
Output level	-13 dBm – 50 dBm
Sinusoidal (CW)	10 kHz – 1,000 MHz
Modulation	AM 1 – 3,000 Hz, 0 – 95%
	PM 1 – 3,000 Hz
	Duty cycle 10% – 80%
Output	N-connector
Built-in power meter	Channel 1 forward power
	Channel 2 reverse power
	Channel 3 injected current
Built-in coupler	Max 200 W/1 GHz
Test method	Closed loop

CWS 500N3

Audio frequency and magnetic field testing

› Conducted & radiated immunity up to 250 kHz
› Built-in voltage/current measurement
› Built-in coupling transformer 1 : 2

ISO 11452-10, vehicle manufacturer specifications, SAE J1113, MIL-STD 461

TECHNICAL DATA (OVERVIEW)	
Conducted immunity	ISO 11452-10
Output level	0.001 V – max. 6.5 Vrms
Output current	Max. 14 A
Frequency range	10 Hz to 250 kHz
Output power nominal	100 W
Output power peak	400 W
Output impedance	‹ 0.5 Ω
Harmonic distortion	‹ 15 dBc at max. power
Coupling	Audio transformer included
Measurements	Freq. selective volt/amp meter
Verification load	0.5 Ω & 4 Ω included
Radiated immunity	ISO 11452-8
Magnetic field	Max. 1,000 A/m up to 1 kHz
Frequency range	15 Hz to 150 kHz
Radiating loop	As per MIL 461E
Magnetic field sensor	As per ISO 11452-8
Current sensor	Included

ELECTROSTATIC DISCHARGE

Electrostatic discharges either from a human body to any other part or between two different objects can cause persistent disturbances or even destruction to sensitive electronics or controls. Voltages of several thousand volts are generated. dito is the most advanced ESD tester to simulate ESD pulses as accurately as possible according to the latest standards.

DITO

The ultimate ESD tester

› Ergonomic design
› Modular concept
› Ease of handling

Bellcore GR-1089-Core, EN 300340, EN 300342-1, EN 300386 V1.3.2, EN 301489-1, EN 301489-7, EN 301489-17, EN 301489-24, EN 55024, IEC 61000-4-2, ITU-T K.20, ITU-T K.21, ITU-T K.45, ISO 10605, JASO D001-94, Chrysler PF 9326, DaimlerChrysler PF-10540, Fiat 9.90110, Ford WDR 00.00EA, Renault 36.00.400/B, Renault 36.00.400/C, Toyota TSC3500G, Toyota TSC3590G, Volvo EMC requirements (1998), EN 300329

TECHNICAL DATA (OVERVIEW)	
ESD as per IEC 61000-4-2	
Test voltage	0.5 – 16.5 kV
Discharge	Air/contact discharge
Polarity	Positive/negative
Hold-on time	› 5 s
R/C parameter	150 pF/330 Ω
Specification contact discharge	500 V to 10 kV
Rise time tr	0.7 – 1 ns
Peak of discharge currents	3.75 A/kV
ESD as per ISO 10605	
Test voltage	0.5 – 16.5 kV
Discharge	Air/contact discharge
Polarity	Positive/negative
R/C parameters	100 pF/1,500 Ω
	150 pF/330 Ω
	330 pF/330 Ω
	150 pF/2,000 Ω
	330 pF/2,000 Ω
Specification contact discharge	500 V to 10 kV
Rise time tr	0.7 – 1 ns
Peak of discharge currents	3.75 A/kV

ESD 30N

ESD tester up to 30 kV

› Up to 30 kV contact & air discharge
› Interchangeable discharge networks
› For automotive, commercial and military applications

IEC 61000-4-2, ISO 10605, SAE J1113-13, SAE J1455, BMW 600 13.0 (Part 2), BMW GS 5002 (1999), DaimlerChrysler DC-10613, DaimlerChrysler DC-10614, Mercedes AV EMV, Ford ES-XW7T-1A278-AB, GMW 3097, GMW 3097 (2001), GMW 3100, GMW 3100 (2001), Mazda MES PW 67600, Mitsubishi ES-X82010, Nissan 28401 NDS 02, Porsche, PSA B21 7110, Renault 36.00.808/-D, Renault 36.00.808/-E, Renault 36.00.808/-F, Smart DE1005B, VW TL 824 66, MBN 10284-2:2002, Renault 36.00.808/-G

TECHNICAL DATA (OVERVIEW)	
ESD as per IEC 61000-4-2 and ISO 10605	
Test voltage	Max. 30 kV
Discharge	Air/contact discharge
Polarity	Positive/negative
Hold-on time	› 5 s
Specification contact discharge	0.2 – 30 kV
Rise time tr	0.7 – 1 ns
Peak of discharge currents	3.75 A/kV
R/C parameters	150pF/330 Ω –– 330pF/330 Ω
	150pF/2,000 Ω –– 330pF/2,000 Ω
	100pF/1,500 Ω –– customized
Special technical highlights	
- RC network values indicated on the LCD	
- AD or CD discharge mode indicated on the LCD	
- Active discharge finger control	
- Bleed-off function to discharge the EUT	
- Temperature and humidity sensor included	
- USB or optical interface included	
- esd.control software	
- Power supply: AC (88 – 250 V), DC (11 – 16 V)	
- Battery mode included for several hours	

ACCESSORIES

CNI 501/503

Combined coupling/decoupling networks for burst and surge CNI 501/CNI 503

› Connection to: UCS 500Nx, EFT 500Nx, VCS 500Nx

The coupling network is the central connection point in a fully automatic test set-up. With coupling network type CNI 503, burst and surge pulses as well as voltage dips and voltage variations are coupled onto the selected supply lines.

CNV 501/503

Coupling/decoupling networks CNV 501/CNV 503 for surge

› Connection to: VCS 500Nx

The coupling network is the central connection point in a fully automatic test set-up. With coupling network type CNV 503, surge pulses are coupled onto the selected supply lines.

CNV 504N/CNV 504S1/ CNV 508N/CNV 508S1

Coupling/decoupling networks series CNV 504N/CNV 504S1/ CNV 508N/CNV 508S1

› Connection to: UCS 500Nx, VCS 500Nx

The coupling networks in series CNV 504/508 are used to superimpose the surge pulse onto signal and data lines as well as onto telecommunication lines.

MV26XX

Motor variac type MV26xx for tests according to IEC/EN 61000-4-11

› Connection to: UCS 500Mx, PFS 503Sx

The motor variac is used for adjusting the required dip voltage and voltage variation continuously.

MV3P40XXDS

3-phase motor variac for Delta-Star tests. For tests according to IEC/EN 61000-4-11 and IEC/EN 61000-4-34

› Connection to: PFS 503Sx

The motor variac is used for adjusting the required dip voltage and voltage variation continuously. For 3-phase applications the variac can be used for STAR and DELTA systems as well.

V4780/V4780S2

Tap-off transformer type V4780 for tests according to IEC/EN 61000-4-11

› Connection to: UCS 500Mx

The V4780 is a tap-off transformer to achieve the fixed 40%, 70% and 80% dip levels. This unit is also available as a remote-controlled model V4780S2.

HFK

Coupling clamp according to IEC/EN 61000-4-4

› Connection to: UCS 500Nx, EFT 500Nx

The capacitive coupling clamp is used to couple the burst pulses onto control and data lines.

CA EFT

Calibration set acc. to IEC/EN 61000-4-4, ed. 2

› Connection to: UCS 200N, UCS 500Nx, EFT 500Nx

The pulse shape of EFT/burst generators designed as per IEC 61000-4-4 have to be verified at 50 Ω as well at 1,000 Ω load. Both matching resistors additionally include a voltage divider to measure the wave form.

MS 100

Magnetic field test antenna according to IEC 61000-4-8/-9 and EN 61000-4-8/-9

› Connection to: UCS 500Nx, PFS 503Sx, VCS 500Nx OCS 500M

Type MS 100:
› 30 A/m continuous,
› 1,000 A/m short term
› Pulsed up to 2,200 A/m

MV2606N2.1

Motor variac for tests according to IEC/EN 61000-4-16 – galvanically isolated

› Connection to: CWS 500N4

The motor variac is specifically designed for conducted low-frequency tests according IEC/EN 61000-4-16. Supports tests at present supply frequency.

ACS 500N2.1

Single-phase AC voltage source 2 kVA for tests according to IEC/EN 61000-4-16 – galvanically isolated

› Connection to: CWS 500N4

ACS 500N2.1 is an electronic AC source, specifically designed for conducted low-frequency tests according IEC/EN 61000-4-16. Supports tests at various supply frequencies.

CDN T2-16/CN L2/L4-16

› Connection to: CWS 500N4

› Coupling/decoupling networks for communication ports and signal/datalines as well as AC/DC power supply lines according to IEC 61000-4-16

ITP, ITP/H

Immunity test probes for pre-compliance tests acc. to IEC 61000-4-3

› Connection to: UCS 200N, UCS 500Nx, EFT 500Nx

Generates electrical and magnetic fields. Set includes different test probes.
The test probes can be connected to the above-listed generators for burst application. These test probes allow preliminary testing acc. to IEC 61000-4-3 during development.

CA ISO

› Connection to: UCS 200N, LD 200Nx, LD 200Sx

A different set of resistors is used for the verification of transient generators as per Iso 7637-2. The generator output is measured under matched load conditions which means $R_I = R_L$.

EAS 30

Earth grounding resistor acc. to IEC 61000-4-2

› Connection to: ESD 30N, dito

To discharge the horizontal and vertical coupling plane to the reference ground plane. The EAS 30 is necessary for the test set-up according to the relevant standard.

VCP

Vertical coupling plane acc. to IEC 61000-4-2

› Connection to: ESD 30N, dito

› Consisting of a coupling plane and an EAS 30
› Adapter for contact discharge
› A 10 cm isolating distance is obtained by a wooden support

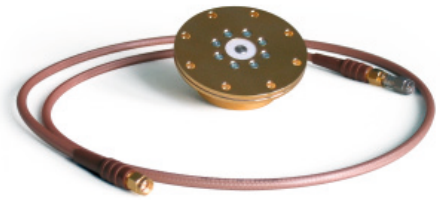
CDN

Coupling/decoupling networks according IEC 61000-4-6

› Connection to: CWS 500N1, CWS 500N2

- › Suitable calibration adapters for all available CDNs
- › Coupling clamp (EM clamp)
- › Current injection
- › T50, 50 Ω termination resistor
- › R-100, 100 Ω matching resistor

CTR2



› Connection to: ESD 30N, dito

The CTR2 is a coaxial current target designed to monitor electro-static discharges as required in IEC 61000-4-2.

CTR2-AD

› Connection to: ESD 30N, dito

The CTR2-AD is a conical adapter to connect the CTR2 into a 50 Ω measuring system for verification.

RADIATING LOOP

› Connection to: CWS 500N3

Radiating loop as per MIL-STD 461 to generate magnetic fields.

LOOP SENSOR

› Connection to: CWS 500N3

Loop sensor as per MIL 461 to measure magnetic fields.

ACC

Capacitive coupling clamp according to ISO 7637-3

› Connection to: UCS 200N

The capacitive coupling clamp is used to couple pulses 1, 2 and 3a + 3b onto control and data lines.

RDS 200/RDS 200S1

Ford ES-XW7T CI 230 ...

› Connection to: PFS 200Nx, AutoWave

RDS 200 is a remote-controlled DC voltage source with a built-in current sink and is used to generate battery supply variations. It is controlled via the 0 – 10 V DC analogue signal from the PFS 200N for voltage dips or by an arbitrary generator to generate signals, e.g. as required by Ford's CI 230 specification.

INJECTION AND MONITORING PROBES

F-130A-1, F-140, F-120-6A, F-120-9A

› Connection to: CWS 500N1, CWS 500N2

› Current injection probes
› Calibration jigs
› Matching impedance and termination resistors

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NOTES

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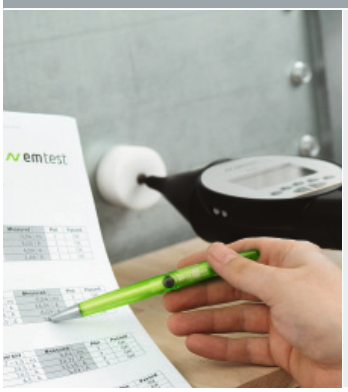

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